THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXXVI. No. 903.] LONDON, AUGUST 31, 1880. [32ND YEAR. Price 6d.

GAS PURIFICATION
BY
OXIDE OF IRON.

COOKE BROS.,

CENTRAL DEPÔTS:
CO. DONEGAL, IRELAND;
LONDON DEPÔT:
ERITH,
OFFICES:
2, CROSBY SQUARE,
LONDON, E.C.

GENUINE TORBAY PAINT
And SPECIAL GASOMETER PAINT.
SEVERAL PRIZE MEDALS. ESTABLISHED OVER 20 YEARS.
These Paints are now used by all the London Gas Companies and most of the principal Country Gas Companies, on Gasholders, Scrubbers, Purifiers, &c. Also used by the Admiralty, War Office, Railway Companies, Founders, &c. They prevent and arrest rust, and protect iron from the action of water, sulphurous and gaseous exhalations; do not crack, blister, or flake off; will cover tar effectually.
The covering powers are considerably greater than those of any other Paint.—*See "Engineer," Nov.* 2, 1866.
Supplied, mixed ready for use, or in paste, as desired.
TORBAY PAINT COMPANY.
PROPRIETORS: STEVENS & CO.,
21, GREAT WINCHESTER STREET, LONDON.
WORKS: BRIXHAM, TORBAY.

TUBES.

Tubes and Fittings for Gas, Steam, Water, and Hydraulic purposes, plain, galvanized, white enamelled inside, or coated by Dr. Angus Smith's process, or oxidized by Professor Barff's patent process. Gas-fitters tools, brass cocks, &c.

JOHN SPENCER,
VULCAN TUBE WORKS,
WEST BROMWICH, STAFFORDSHIRE,
AND
97, CANNON STREET, LONDON.

COWEN'S PATENT FIRE-CLAY RETORTS.
JOSEPH COWEN and CO.,
BLAYDON BURN, BLAYDON-ON-TYNE,
Were the only parties to whom a PRIZE MEDAL was awarded at the GREAT EXHIBITION of 1851, for "GAS-RETORTS and other OBJECTS in FIRE-CLAY," and they were also awarded at the INTERNATIONAL EXHIBITION of 1862, the PRIZE MEDAL for "GAS-RETORTS, FIRE-BRICKS, &c., for EXCELLENCE of QUALITY."
J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts and Fire-Bricks in the Kingdom. Orders for Fire-Clay Retorts of all shapes and dimensions, and to fit any shaped Mouthpiece, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.
COWEN'S GARESFIELD COALS.
JOS. COWEN & CO. are the only Manufacturers of FIRE-BRICKS and CLAY RETORTS at BLAYDON BURN.

JOHN RUSSELL & CO.,
LIMITED,
Established at the commencement of Gas Lighting,
MANUFACTURERS OF
TUBES AND FITTINGS.
THREE PRIZE MEDALS,
Paris, 1878.
HEAD LONDON OFFICE:
145, QUEEN VICTORIA STREET.
ALMA TUBE-WORKS, WALSALL;
OLD PATENT TUBE-WORKS, WEDNESBURY.

JOHN BENT & SON,
BELL BARN ROAD, BIRMINGHAM,
MANUFACTURERS OF
WET AND DRY GAS-METERS,
LICENSEES AND MANUFACTURERS OF
HUNTS
PATENT COMPENSATING METERS,
STREET-LAMPS, &c., &c.
ESTABLISHED 1830.

THOMAS PIGGOTT & CO.,
SPRING HILL, BIRMINGHAM,
MANUFACTURERS OF
TELESCOPIC & SINGLE GASHOLDERS,
CAST & WROUGHT IRON TANKS FOR DITTO,
And Gas Apparatus of every Description.
Marine, Tubular, Cornish, Plain, Furnace, Saddle, and Range Boilers.
SUGAR, SALTPETRE, AND ALL KINDS OF PANS.
Roofs, Girders, and Bridges, and General Smith's Work.
London Offices: 97, CANNON STREET—
JAMES E. & SAMUEL SPENCER, Agents.

THE
"OTTO" GAS-ENGINE,
From ½ to 40 H.P. ind.

See Page 326.

CROSSLEY BROTHERS,
MANCHESTER AND LONDON.

THE
DUKE OF HAMILTON'S
LESMAHAGOW
CANNEL COAL.

AGENT:
JAMES M'KELVIE,
HAYMARKET,
EDINBURGH.
ESTABLISHED 1840.

GEORGE GLOVER AND CO.,

PATENTEES OF THE
NATIONAL STANDARD GASOMETERS
AND MANUFACTURERS OF
IMPROVED DRY GAS-METERS.
GOLD MEDAL. HIGHEST AWARD.

INTERNATIONAL EXHIBITION,
SYDNEY, 1880.
RANELAGH WORKS, ROYAL AVENUE, CHELSEA, LONDON, S.W.
1, LANCASTER AVENUE, MANCHESTER.
Foreign Agents: DAHL BROS., Copenhagen; A. FAAS & CO., Frankfort-on-Maine; W. HOVEN & SON, Rotterdam; COPLAND & M'LAREN, Montreal; A. DEMPSTER, 57, Elizabeth Street, Melbourne.

WELLINGTON TUBE WORKS,

GREAT BRIDGE, TIPTON, STAFFORDSHIRE.

JOSEPH AIRD,

GAS, STEAM, AND HYDRAULIC TUBES AND FITTINGS.

DANIEL HOWARD,

(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER AND BOILER WORKS,

WEST BROMWICH, NEAR BIRMINGHAM (Established 1765),

MANUFACTURER OF

TELESCOPIC AND SINGLE GASHOLDERS,

WROUGHT AND CAST-IRON TANKS FOR DITTO.

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, AND ALL KINDS OF GAS APPARATUS.

WROUGHT-IRON ROOFS, BRIDGES, GIRDERS, ETC.

STEAM, HOT WATER, AND RANGE BOILERS, TANKS, CISTERNS, BOATS,

AND ALL KINDS OF WROUGHT-IRON WORK.

Drawings, Specifications, and Estimates supplied on application.

GOLDSMITH'S PATENT SIGHT WATER-LINE INDICATING GAS-METER.

MANUFACTURED BY GUEST AND CHRIMES,

FOUNDRY AND GENERAL BRASS WORKS, ROTHERHAM;

AND 85, SOUTHWARK ST., LONDON, S.E.

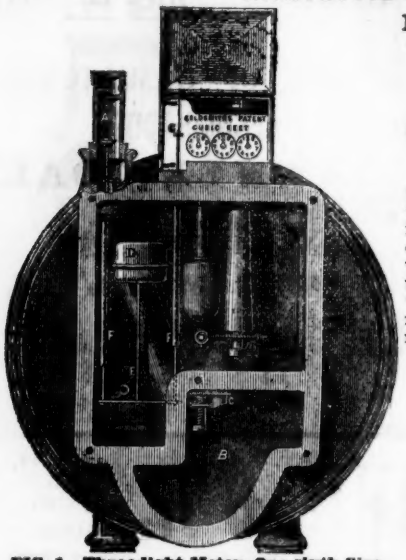


FIG. 1.—Three-light Meter, One-sixth Size.

Fig. 1 is a Meter with front removed to show the arrangement and connection of the Indicator and Valve.

Fig. 2 is front view of Index, with cover up.

The principal object of this invention is to render the water-line in the reservoir at all times visible. It will be seen, by reference to the illustrations, that this is accomplished in the following manner:—On the dial are the words "Open" and "Shut," and attached to the float is the pointer G, which rises and falls with the water-line in the reservoir. If the pointer is at "Open," it shows that the valve is open, and that the reservoir is full. If it is at "Shut," it shows that the reservoir is empty, and that the gas will be shut off.

The following ADVANTAGES will be obvious:—

1. The Inspector can see at a glance if the Meter requires water.
2. No more water than is required need be added, and therefore no water has to run out.
3. The Meter Inspector will be spared a great deal of his most objectionable work, and he will save a great deal of time and trouble.
4. The consumer will not always have to be asked for water, nor will he have to endure the unpleasant smell caused by waste water being run out.

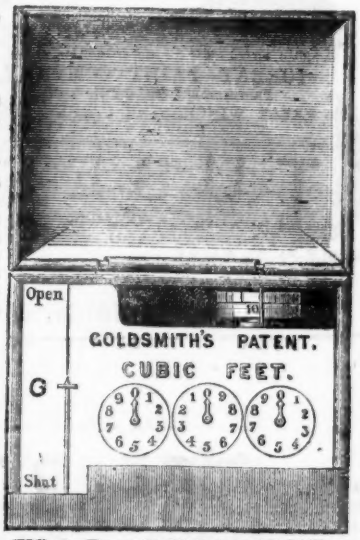


FIG. 2.—Three-light Index, Half Size.

TRADE MARK.

THE MEDAL FOR 1862.

The only Prize Medal awarded for TUBES & FITTINGS.

CROWN TUBE-WORKS,

WEDNESBURY, STAFFORDSHIRE.

WAREHOUSE: SOUTHWARK STREET, LONDON.

JAMES RUSSELL & SONS, LIMITED,

PATENTEES & FIRST MAKERS OF WROUGHT-IRON TUBES,

ONLY MAKERS OF HOMOGENEOUS METAL TUBES.

MANUFACTURERS OF

TUBES and FITTINGS for GAS, STEAM, and WATER;

LAP-WELDED, LOCOMOTIVE, MARINE, and other BOILER TUBES;

HYDRAULIC TUBES, BEDSTEAD TUBES, WELL TUBES, TELEGRAPH POSTS, COILS, &c.;

GAS-FITTERS TOOLS, VALVES, COCKS, &c.

THOMAS PIGGOTT & CO.,

(Established 1822,)

SPRING HILL, BIRMINGHAM.

MANUFACTURERS OF

TELESCOPIC & SINGLE GASHOLDERS,

CAST & WROUGHT IRON TANKS FOR DITTO;

PURIFIERS, CONDENSERS, SCRUBBERS, RETORTS, VALVES;

IMPROVED WROUGHT-IRON RETORT-LIDS, CROSS-BARS, & SCREWS;

AND GAS APPARATUS OF EVERY DESCRIPTION.

SOLE MANUFACTURERS OF LIVESEY'S PATENT GASHOLDER MAN-LID,

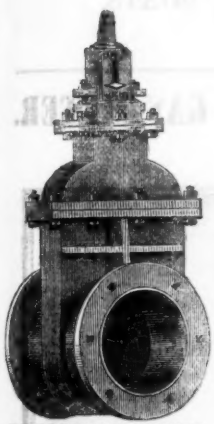
By use of which Man-lid, inlet and outlet pipes can be examined and cleansed without loss of gas in crown of holder or ingress of atmospheric air.

ROOFS, GIRDERS, BRIDGES, AND BOILERS OF ALL KINDS.

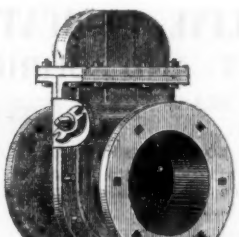
Drawings, Specifications, and Estimates supplied on application.

LONDON OFFICES: 97, CANNON STREET—JAMES E. & SAMUEL SPENCER, AGENTS.

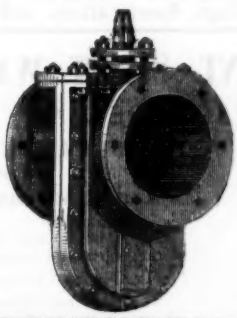
C. & W. WALKERS' GAS-VALVES.



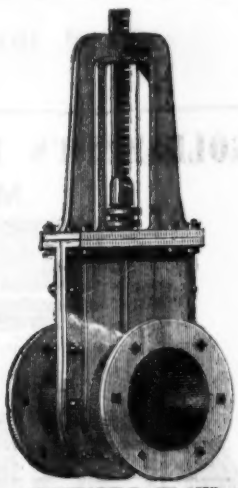
DOUBLE-FACED VALVE SPECIALLY FOR PURIFIERS.



INTERNAL RACK-VALVE WITH STEEL PINION, FOR GENERAL USE.



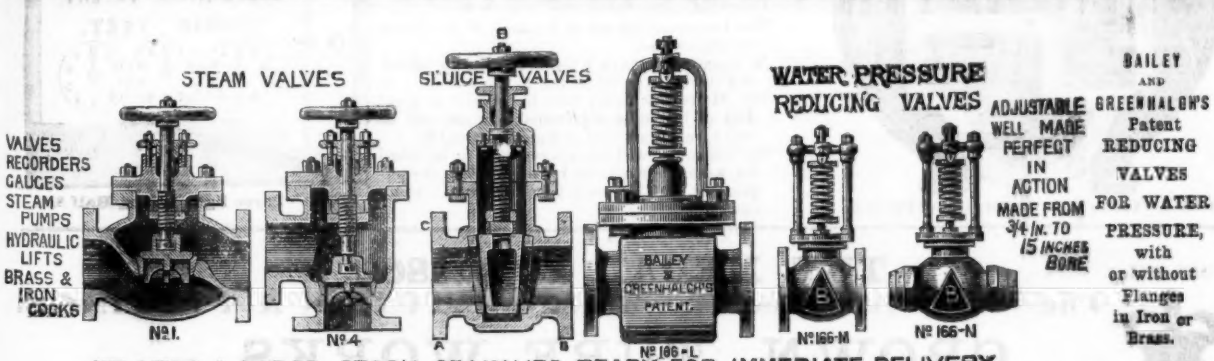
UNDERGROUND SCREW-VALVE FOR SHALLOW STREET-MAINS.



ORDINARY RACK AND PINION VALVE.

MIDLAND IRON-WORKS,

DONNINGTON, near NEWPORT, SHROPSHIRE; 8, FINSBURY CIRCUS, LONDON.



WE KEEP A LARGE STOCK OF VALVES READY FOR IMMEDIATE DELIVERY.

W. & H. BAILEY CO., Valve and Cock Makers, General Brass Founders for Gas and Water Works, ALBION WORKS, SALFORD, MANCHESTER.

ROBT. DEMPSTER & SONS,

GAS ENGINEERS, IRONFOUNDERS, AND CONTRACTORS,

ROSE MOUNT IRON-WORKS, ELLAND, YORKSHIRE.

MANUFACTURERS OF EVERY DESCRIPTION OF

GAS APPARATUS;

CONTRACTORS FOR THE

ERECTION OF PUBLIC AND PRIVATE GAS-WORKS

Plans and Specifications Prepared, and Illustrated Catalogues forwarded on application.

GAS PURIFICATION

BY

OXIDE OF IRON.

GAS PURIFICATION & CHEMICAL Co., LIMITED,

PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.

JOHN WM. O'NEILL, Managing Director.

GAS *v.* ELECTRIC LIGHT.

WIGHAM'S PATENT LIGHTHOUSE GAS-BURNERS,

For Street Lighting and the Illumination of Large Halls, Factories, Ship Yards, &c., where Powerful Light is required

These Burners have been adopted by a School Board, having large school-rooms in charge, because of their high illuminating power and the facilities they give for perfect ventilation. The actinic power of these Burners is such that they are used successfully for Photography and Photo-Lithography.

SOLE MANUFACTURERS:

J. EDMUNDSON & CO., Gas Engineers, 19, GREAT GEORGE STREET, WESTMINSTER, LONDON, S.W.

MECHANICAL CONDENSATION.

The undersigned has arranged with Messrs. Pelouze and Audouin the exclusive agency for their patented system of Condensation, in Great Britain and the Colonies.

The following are some of the advantages which this philosophic mode of arresting liquefiable vapours possesses:—

1. It acts irrespective of temperature.
2. It requires no motive power, but automatically adapts itself to production.
3. It may be fixed directly after the hydraulic main, by which prolonged contact of the gas with tar is avoided, and the highest standard of illuminating power is obtained which the coal is capable of giving; or it may be fixed directly after an ordinary air condenser, when it will arrest the vapoury globules which cooling alone will not stop, and the production of tar and ammonia water is thereby increased.
4. It effects a considerable saving in purification, through no tar getting to the material to clog its action.
5. It entirely supersedes the necessity of scrubbers; and if wet sawdust be used in a purifier, washers also are unnecessary.
6. It occupies but little space, and avoids that which is now considered a disadvantage—the too much cooling, scrubbing, and washing of gas.

Further particulars may be obtained of

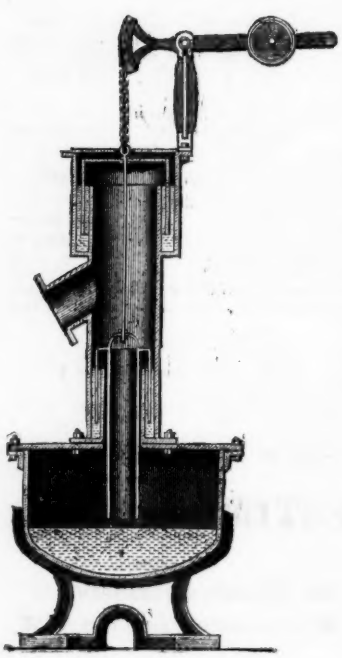
GEO. BOWER, St. Neots, Hunts.

NOTE.—*Gas-works contracted for complete, or apparatus supplied in detail from the retort to the burner. "The Gas and Water Engineer's Book of Reference," post free, 5s. "Handy Abstract of the Public Health Act, 1875," post free, 1s.*

SELF-ACTING REMOVABLE DIP-PIPE,

PATENTED BY

CHANDLER & STEVENSON.



The following Testimonials, as to five years constant working of this Patent Removable Dip, have been received:—

Metropolitan District Asylum Gas-Works, Caterham, Surrey, Jan. 15, 1874.

MESSRS. CHANDLER and SONS.

DEAR SIRS,

In reply to your inquiries, I beg to inform you that since I have used your Patented Dips (ten in number), I find my make has increased over 1000 cubic feet per ton of coal carbonized, my usual make being 9070 cubic feet before using your Dips, and 10,150 cubic feet since using them.

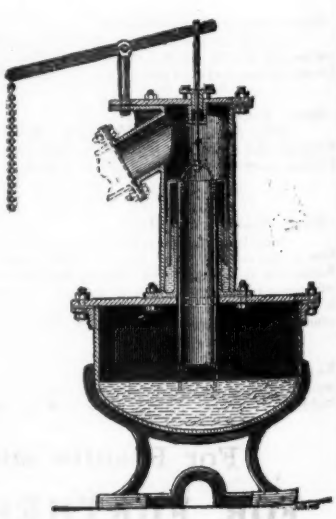
Metropolitan District Asylum Gas-Works, Caterham, Surrey, Dec. 30, 1879.

MESSRS. CHANDLER and SONS.

DEAR SIRS,

In reply to your inquiry, it is with very much pleasure thatI endorse every word of my letter of Jan. 15, 1874; and I may add that from the date the Patent Dips were fitted, they have worked perfectly, and there is very little carbon deposited in the retorts, in consequence of the lower pressure.

Yours faithfully,
(Signed) W. CRICKMAY,
Memb. Soc. Engineers.



APPLICATIONS TO BE MADE TO

Messrs. CHANDLER & SONS,

104, NEWINGTON CAUSEWAY, S.E.

KIRKHAM, HULETT, & CHANDLER, LIMITED.

PATENT "STANDARD" WASHER-SCRUBBER,

FOR

GAS PURIFICATION,

TAKES OUT EVERY TRACE OF AMMONIA AND A LARGE QUANTITY OF CARBONIC ACID AND SULPHURETTED HYDROGEN BY ONCE PASSING THROUGH THE MACHINE.

AMMONIACAL LIQUOR OBTAINED OF ANY REQUIRED STRENGTH.

The Cost of the Machine defrayed by the Ammonia obtained in Twelve Months. It requires very little attention, and cannot get out of order.

These Machines, which contain from 3200 feet to 65,000 feet of Wetted Surface, are supplied to the following Gas-Works:—

	Feet per Day.
The Gaslight Company, London—	
Beckton	5,000,000
Bromley	7,000,000
St. Pancras	3,000,000
Bradford Corporation	1,000,000
Bremen	150,000
Buxton Local Board	250,000
Dukinfield Local Board	500,000
Driffield Company	100,000
Goole Company	250,000
Glossop Company	300,000
Holywood Company	125,000
Heywood Local Board	600,000
Leeds Corporation	2,000,000
Leominster Company	150,000
Maidstone Company	1,000,000
Phœnix Company, Greenwich	2,500,000
„ „ Vauxhall	3,000,000
Woolwich Equitable Company	400,000
Yeadon Company	500,000

And many in course of Construction, among others—

Feet per Day each.	For
Four for 3,000,000	Corporation of Leeds.
Three „ 1,750,000	Corporation of Salford. [Station.
One „ 2,500,000	The Gaslight Co., Shoreditch
Two „ 1,250,000	The Gaslight Company, Beckton.
One „ 3,000,000	London Gas Co., Nine Elms.
One „ 1,250,000	Corporation of Nottingham.
One „ 2,000,000	Cheltenham Gas Company.
One for 1,000,000	West Bromwich Improvement [Commissioners.
One „ 750,000	Radcliffe and Pilkington Gas Co.
One „ 500,000	Oldbury Local Board.
One „ 150,000	Falmouth Gas Company.
One „ 250,000	European Gas Company, Rouen.
One „ 200,000	Deal Gas Company.

TESTIMONIALS.

Messrs. KIRKHAM and HERSEY. *The Gaslight and Coke Company, Beckton, North Woolwich, June* 8, 1880.

Gentlemen,—I enclose you some particulars of the working of your Washers here, and I intend having some more experiments made, as just now we are working the first Washer with liquor, and the second with water. Of course the fact of our having ordered two more in addition to the four which we have in use is a sufficient indication of my opinion of the value of the Washer. (Signed) G. C. TREWBY.

Messrs. KIRKHAM and HERSEY. *South Metropolitan (late Phœnix) Gaslight Company, Engineer's Office, June* 19, 1880.

Dear Sirs,—The "Standard" Washer which you supplied for use at our Vauxhall station has afforded me entire satisfaction. It was designed to remove the ammonia from 3 million cubic feet of gas per day, and during the past winter it did so with a good working margin to spare. It is as excellent now in workmanship as in design, and is well worthy of the general acceptance with which it appears to be meeting.

I am, faithfully yours, (Signed) CORBET WOODALL.

Messrs. KIRKHAM and HERSEY. *Phœnix Gaslight and Coke Company, Office, Greenwich, S.E., Aug.* 12, 1879.

Gentlemen,—In reply to your inquiry, one of your Patent Scrubber-Washers to purify 100,000 cubic feet per hour was put into operation at these works on the 1st of June. At the same moment the whole of our Scrubbers, equal to 28,000 cubic feet, were thrown out of use, leaving your Washer the whole work of freeing the gas from Ammonia. This it has done to perfection up to date. With 10 gallons of water to each ton of coal carbonized passing through it we get a clean test at the seventh chamber, leaving four chambers margin for extra work. The mean quantity of Ammonia in the inlet (fixed and free), obtained from a large number of tests, was 241 grains per 100 feet of gas. On the outlet—Free Ammonia—Nil. The quantity of water used is 10 gallons per ton of coal carbonized. The strength of liquor as follows:—

Chamber No.	1	2	3	4	5	6	7	8	9	10	11
Strength of liquor—ounces	Nil.	Nil.	Nil.	Nil.	0·4	1·0	2·2	3·5	5·5	8·25	12·5

We are working five revolutions per minute. It takes out all the free Ammonia, reduces the carbonic acid and sulphuretted hydrogen 30 per cent., requires a very small amount of power to drive, and altogether is, in my opinion, the best machine for the purpose yet invented, and will, I feel confident, ere long, entirely supersede the Scrubbers of to-day. I am glad to find you are going to fix one of these Washers at our Vauxhall works.

(Signed) P. J. WATES, Engineer.

For Results and other Testimonials, see next week's Journal.

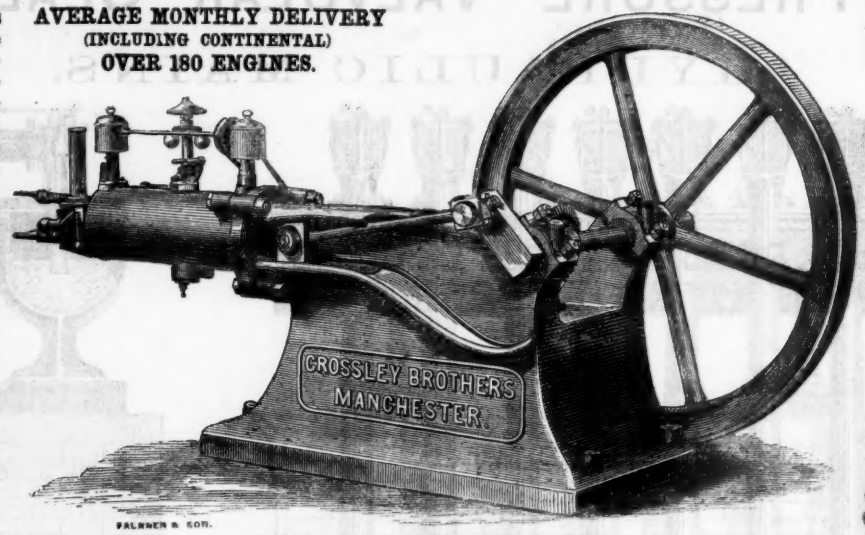
FOR FURTHER PARTICULARS AND TESTIMONIALS, ADDRESS MESSRS.

KIRKHAM, HULETT, & CHANDLER, LIMITED, { 59 & 60, Palace Chambers, Bridge St. Westminster, London, S.W.

AN ENGINE WHICH WORKS WITHOUT A BOILER OR STEAM

These Engines are used at the following Gas-Works:—Birmingham, Brentford, Bucharest, Bishop Stortford, Driffield, Dundalk, Dundee, Dublin, Huddersfield, Hinckley. London—London Gas-Works, Phœnix Gas Co., Gaslight and Coke Co., South Metropolitan Gas Co., Commercial Gas Co., Crystal Palace District. Leominster, Edinburgh and Leith Ludlow Union, Lancaster, Maidstone, Nuneaton, Northampton,

AVERAGE MONTHLY DELIVERY
(INCLUDING CONTINENTAL)
OVER 180 ENGINES.



Shanghai, Sheffield, Worcester, Wantage, &c.

Over 2500 already delivered.

Very numerous Testimonials from Users, including Engineers, Men of Science, and others, on application to the makers.

No trouble with Coal, Ashes, Smoke, Insurance, Water, or constant attendance.

No Glands to pack, or Water Gauges and Steam Gauges to watch.

STARTS AT A MOMENT'S NOTICE.

THE "OTTO" SILENT GAS-ENGINE,

From ½ to 40 Horse Power Indicated.

(Otto and Crossley's Patents, 1876 and 1877.)

THEY ARE USED FOR ALL KINDS OF PURPOSES, CHIEFLY FOR EXHAUSTERS, SCRUBBERS, & PUMPS.

DELIVERED IN MANCHESTER. CASES NOT CHARGED IF RETURNED FREE.

PRICES INCLUDE CAST-IRON STAND, TURNED FLY-WHEEL, AND DRIVING PULLEY; WATER-VESSEL, SEVERAL DUPLICATES, AND GAS-FITTINGS (EXCEPTING METER AND PIPES).

WORKS AND HEAD OFFICES:
Gt. Marlbro' St., Gloster St.

CROSSLEY BROTHERS,

MANCHESTER.

LONDON HOUSE:
116, Queen Victoria St., E.C.

EDWARD E. CROMBIE & CO.,

INVENTORS AND PATENTEES
OF THE

FRICTIONLESS DRY GAS-METERS,

Beg to intimate to Gas Companies and others that they are now prepared to supply these very superior Meters at the same prices as for the ordinary Gas-Meters.

In the construction of this Meter, for which the best tin plates only are used, every mechanical contrivance has been taken advantage of successfully to reduce the friction to a minimum, which is amply proved by the fact that they are made to work upon only one-fortieth of an inch pressure. By an improvement also in their construction, a steadier light is obtained, and greater capacity than can be got from any other Meter in the market. No gas can pass under the valves on any back pressure, as is the case with many other Dry Meters.

To Gas Companies supplying gas through streets with heavy gradients, these Meters are invaluable, as much gas is saved from the low pressure required to work them.

ALL METERS ARE UPHELD FOR FIVE YEARS.

METROPOLITAN WORKS, DIANA PLACE, EUSTON ROAD, LONDON, N.W.

PARIS EXHIBITION, 1878.

THREE MEDALS

AND

HONOURABLE MENTION

HAVE BEEN AWARDED TO

JOSEPH CLIFF & SONS

For their Various Exhibits, amongst which is a

SILVER MEDAL

FOR THEIR

PATENT MACHINE-MADE

RETORTS AND FIRE-BRICKS,

Being the Highest Honour given for this class.

Established

1795.

JOSEPH CLIFF & SONS,

THE ORIGINAL

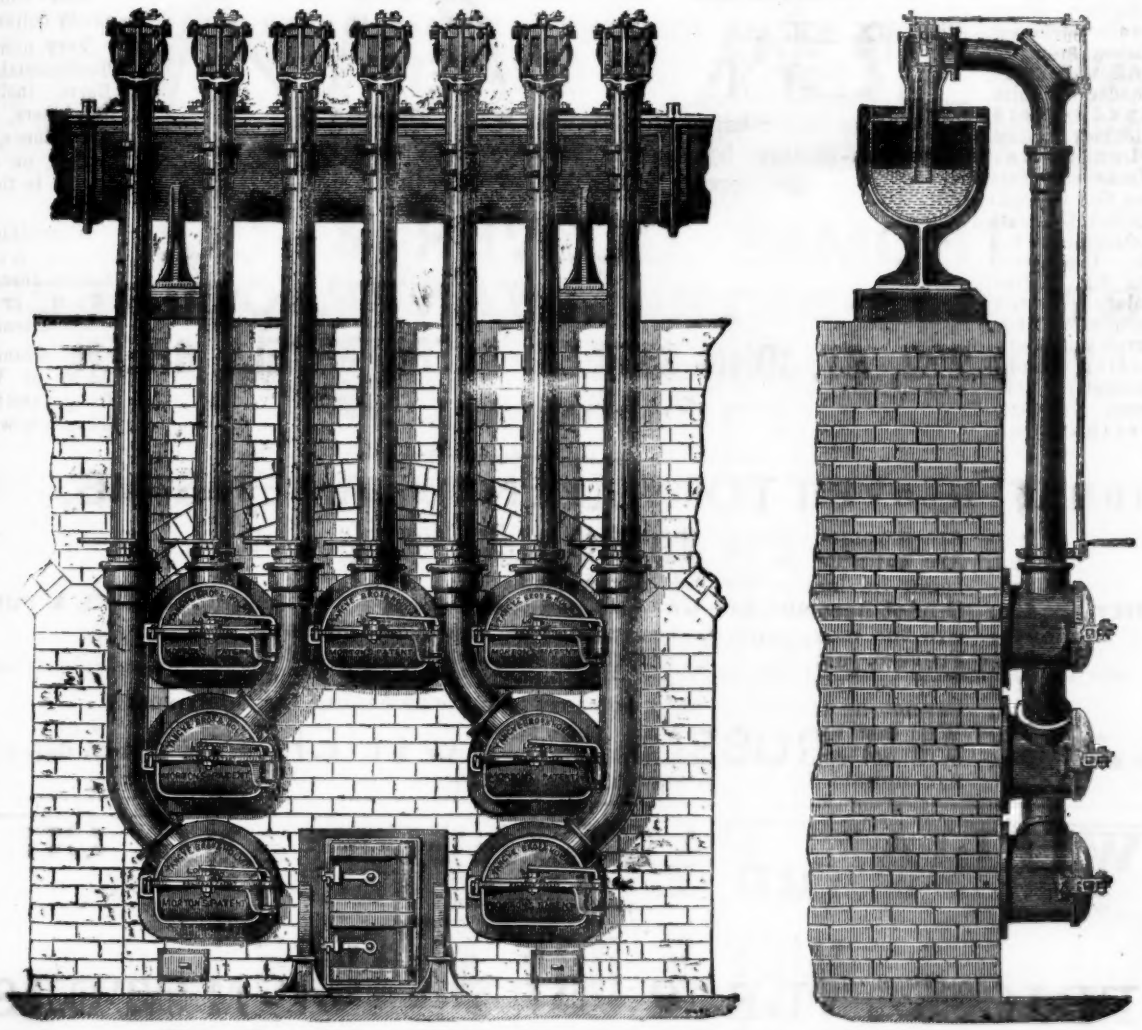
WORTLEY FIRE-BRICK WORKS,

NEAR LEEDS,

London Wharf: No. 4, inside Great Northern Goods Station, King's Cross, N. Liverpool: Leeds Street.

SPECIAL NOTICE.—Our Patent Machine-Made Retorts have now been thoroughly tested, and have proved themselves infinitely superior to those made by hand. At several large works it has been settled, beyond question, that, owing to the compactness and general excellence, more gas is sent to the gasholder from each ton of coal carbonized than is the case with hand-made Retorts.

HOLMAN'S PATENT
NON-PRESSURE VALVULAR SEAL-PIPES
FOR
HYDRAULIC MAINS.



The salient features of the above arrangement are as follows:—

1. The Seal is instantaneously opened and closed from the stage by the stokers.
2. There are only two positions for the actuating lever: one when the Seal is opened during the period of carbonization, the other when it is closed for drawing and charging the retort.
3. The retort can never be blocked, because the port directing the gas *through* the Seal is always opened, and the port permitting the gas to *pass* the Seal *direct* into the hydraulic main is also open while the retort is at work.
4. The manager and stokers can always see at a glance, by the position of the lever, whether the retort is duly unsealed while carbonizing its charge.
5. There are no extraneous seals, stuffing-boxes, hinges, screws, chains, pulleys, springs, teeth, or other complication belonging to the valves; they are made plain and strong for rough use, and will last many years without renewal.
6. The valve faces are always covered and never separated, hence no foreign matter can put them out of action.
7. They are positive, reliable, interchangeable, free from all the uncertainty of automatic arrangements, and low in price.
8. No extra pipes or connections are required, because the Valvular Seal-pipe is self-contained in the single branch of the ascension-pipe, which stands on the hydraulic main, and is easily accessible by removing an ordinary cover secured by two bolts only.

(238) TWO HUNDRED AND THIRTY-EIGHT HOLMAN'S PATENT VALVULAR SEAL-PIPES are being fitted to the Hydraulic Mains at the Radford Station of the Corporation Gas-Works at Nottingham.

(84) EIGHTY-FOUR more are being fitted to the Mains in the New Retort-House of the Gas-Works at Brentford, and they can be readily applied to existing Hydraulic Mains generally.

They are to be fitted to the Hydraulic Mains of the New Retort-House at the LONDON GAS-WORKS, and at other large stations.

Mr. MORTON writes in the following terms, under date of Feb. 3, 1880:—

"Gentlemen,—I have determined to use your HOLMAN'S PATENT NON-PRESSURE VALVULAR SEAL-PIPES in our new Retort-House. Will you, in the meantime, send me, as soon as you can, four as you are now making them. I expect to hear of a large demand for these Pipes. I like the idea of always maintaining a passage through an ordinary dip."

ESTIMATES for Retort Work, including Mouthpieces fitted with Morton's Patent Self-Sealing Lids and Holman's Self-Sustaining Cross-Bars and Fastenings, Hydraulic Mains and Ascension-Pipes, fitted with Holman's Patent Non-Pressure Valvular Seal-Pipes complete (as per accompanying illustration), will be forwarded to Engineers on receipt of particulars of intended erections or re-setting of Retorts during the current or ensuing season.

Engineers preparing Specifications will be furnished with Tracings and all necessary data on application.

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HYDRAULIC AND GAS ENGINEERS,
CORNWALL HOUSE, QUEEN VICTORIA STREET, LONDON, E.C.

London, 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865. Paris 1867.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

THOMAS GLOVER & CO.,

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1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
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9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

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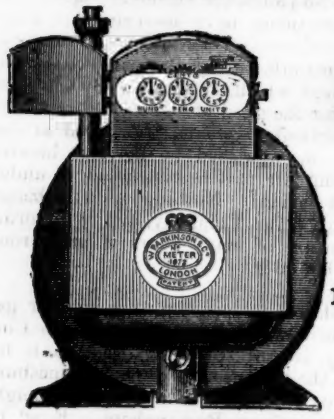

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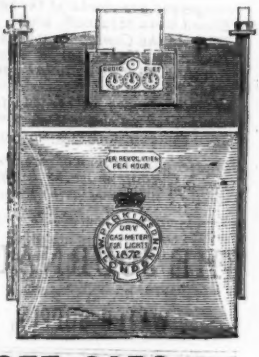
WET & DRY METERS,

STATION-METERS & GOVERNORS,

EXHAUSTER REGULATORS,

PRESSURE REGISTERS, EXPERIMENTAL APPARATUS, GAUGES, WATER-METERS, &c.



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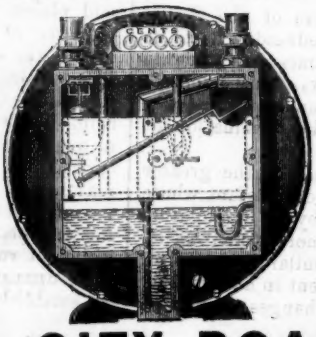
In this Meter, the action of the measuring-drum is reversed. By this arrangement an improvement is effected in the registration at high speeds, which, in many tests, has not varied from the smallest light to three times the capacity of the meter. It works equally well under all pressures. The range of error between the high and low line much smaller than that allowed by the "Sale of Gas Act."



The Meter has been critically tested, and most favourably reported upon by official Meter Inspectors in London and Birmingham.

W. PARKINSON and CO. have made arrangements for the manufacture of these Meters, both in tin and cast-iron cases, and for the alteration of old ones to this principle, which is confidently recommended as possessing every quality that can be desired by Gas Companies, Corporations, or Private Consumers.

COTTAGE LANE, CITY ROAD, LONDON, E.C.

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TO CORRESPONDENTS.

J. T. P.—*Liegel's patent is dated June 19, 1877; No. 2373. We are not aware that Klönne's furnace is patented in England.*

W. K.—*The suggestion you make, though ingenious, is not new. If you refer to the published proceedings of the British Association of Gas Managers for 1878 you will find a similar idea put in practical shape; nor is this the only instance, within our knowledge, where an attempt has been made in this direction. The question, however, still awaits a final solution; and should you be able to embody your proposal in definite form, we shall be open to publish any drawing or description of it.*

Manager of Small Country Gas-Works.—*The Corporation cannot "compel" the Company to sell; but can withhold their sanction to the breaking up of streets, and so cripple the carrying on of the Company's business. The Corporation could, as the Company is non-statutory, erect competing gas-works (if the requisite permission of the Local Government Board were obtained), under clause 161 of the Public Health Act, 1875. Why do the Company not give notice of their intention to apply to the Board of Trade for a Provisional Order, under the Gas and Water Facilities Act, so as to get parliamentary authority for their operations? Then they would be in a position to meet the Corporation, in the event of their moving in the matter; and probably, as in the case of Stone—reported in the last volume of the* Journal, *pp. 136, 329, 719—would gain the day, unless a very strong case can be made out against them.*

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, AUGUST 31, 1880.

Circular to Gas Companies.

The ordinary meeting of the Shareholders of the South Metropolitan Gas Company, held on Wednesday last, at which the report of the Directors and statement of accounts given in another part of this week's Journal were adopted, was convened six or seven weeks earlier than usual, and was in other respects noticeable, as marking the termination of the first stage of a new departure.

The close of the first half year's working of the greater South Metropolitan Gas Company—that young giant whose growth has received such marked impetus by the assimilation of its neighbours—is an event worthy of more than passing reference; yet so rife is the age with similar examples of sudden development, that a running comment in a newspaper is all that can be devoted to even greater changes than have recently taken place in the organization for the gas supply of transpontine London. Yet, to those for whom Metropolitan gas affairs possess any great interest, and to whom the history of the former Companies is familiar, the disappearance of old names, and the alteration in the conditions of things which follow thereupon, invest the half-yearly records of the remaining undertakings with the past glories of all those that have disappeared, as well as with the larger interest that centres round the future possibilities of enterprises which have proved strong enough to survive through the process of selection, and elastic enough to accommodate themselves to the vicissitudes of larger existence amid ever-changing circumstances.

In the case of the South Metropolitan Company the results of the first half year's working of the three united Companies now bearing that title, have been such as to testify in the most practical manner to the wisdom of the policy which brought about the act of union. We have on a former occasion expressed our appreciation of the spontaneous action on the part of the Directors in reducing the price charged for gas in the district of the late Phœnix Company, to the level of that of the rest of the united district, six months earlier than they need have done in accordance with the provisions of the scheme of amalgamation. It may be taken for granted that when the report for the current half year is presented to the Proprietors of the late Phœnix Company's stock they will have as much reason as the consumers to congratulate themselves on the result of the reduction, as in all probability they will then receive 11¼ per cent. dividend—a consideration which will strike the Shareholders of the London Company with all the force of a painful contrast. For the present, dividends of 11¾ per cent. on the "A" stock; 11 per cent. on the "B" stock (late Surrey Consumers capital), and 10¼ per cent. on the "B" stock (late Phœnix capital) must be considered highly satisfactory; as is the announcement that henceforth, in consequence of the price of gas being made uniform, the two divisions of class "B" will be completely merged, and rank equally for dividend and in all other respects. It is not so very long ago that a dividend of 11¾ per cent. on Metropolitan or other gas stock—not under fortuitous circumstances merely, but as a regular thing—would have been regarded as impossible. If profits permitting such a division could be earned, it would have been said that the consumers would have risen in arms against being "robbed" to that extent, yet in the present case we see this high rate of dividend declared in broad daylight, based on accounts passed by an Official Auditor, and yet nobody complains. This is an evidence that a great change has come over the relations of Gas Companies (in London at least) and their customers. The consumers have learned that their interests are, by the action of the sliding scale, made identical with those of the gas manufacturer, and they therefore acquiesce in an arrangement which, although comprehended perchance by few, works for the good of all.

Nothing calling for particular remark transpired at the meeting, which was only distinguished by extreme brevity and general content among all parties concerned, as under the circumstances was but natural. Nothing could be better than the present position of the Company, and, with ordinary fortune, it has a future of many years of prosperous development marked out before it.

The mania for establishing independent districts for gas supply, carved out of the district of the Birmingham Corporation gas undertaking, is still spreading. Aspirants for separation were heard at the last meeting of the Wednesbury Local Board, which locality (with Darlaston its next neighbour) is supplied with gas from Birmingham. Fired by the examples of West Bromwich, Tipton, and Oldbury, a section of the Wednesbury Board have endeavoured to get a resolution passed declaring the expediency of the Board following in the path of the Local Authorities of the aforesaid places, and taking steps to acquire the goodwill and property of the gas undertakings—other than private—within the district over which the Board exercise control. The resolution, although vehemently advocated, was not passed, the opposition to the proposal, led by the Chairman, being too strong both in numbers and, as it appears to us, in argument also. Centralization may in many things be carried too far, and in gas matters especially there is no reason why people in a place which can supply itself should pay strangers to do it for them. But the policy of establishing independent works must be clearly made out, to justify a violent rupture of existing arrangements whereby two or more districts may have been enabled to derive benefit from an establishment for which one of them is alone responsible.

It is perhaps hopeless to contend with representative bodies or corporate authorities for the observance of equity for itself alone, to say nothing of such an altogether Quixotic sense as that of gratitude. It is quite conceivable that, in past times, several separate but adjoining towns might have found it expedient to combine for the purposes of gas supply, which they were individually much too small to undertake; and, in later times, when they had each grown larger, the sudden determination of one of them to make gas for itself might be positively injurious to the place wherein the works were situated, by leaving it encumbered with a property beyond its own requirements. But no consideration of this kind can be held to apply to the present case. It is, of course, a matter of small moment to the Corporation of Birmingham whether or not they continue to supply about fifty million feet of gas per annum to a small outlying district; but from the point of view of Wednesbury gas consumers the case is vastly more important. They now have to pay from 3s. per thousand feet downwards—the diminished rates being a matter of discount—and it is very unlikely that for some years to come at least they could send out gas from works of their own at a lower price. It was stated that the district is not a rapidly growing one, which is a serious consideration in matters of this nature, and so all things present and future being fairly looked at, the gas supply might very well go on as it is. In agreeing to this conclusion, after the question had been properly argued on both sides, we think the Local Board showed sound sense.

The Scarborough Gas Company have had, during the past year, to face a period of depression, which overtook that fashionable north-eastern watering place in common with, or rather in consequence of, the corresponding dulness of trade prevailing at the same time throughout the manufacturing districts whence come the visitors who, in ordinary seasons, crowd the town. In spite of this, however, the Company's business has not suffered; their receipts for the year ending June 30 showing an increase over those of the previous year, while the cost of manufacture has been materially reduced, and the working results generally show a great improvement, not only on the preceding year, but also on the average of the last three years. For this credit must be given to Mr. W. J. Moon, the Company's Manager, who we trust will be able to keep up to the standard he has now set for himself. Scarborough at present appears to have regained much of its pristine gaiety, the index, let us hope, of better times all round. The Lord Mayor of London in all his awful majesty, has favoured the Spa with his presence, and after this it would be almost treasonable to doubt that Scarborough will flourish henceforth as it has never done before.

The communication "On the Use of the Radiometer as a "Photometer," by Professor Pedler, F.C.S., of Calcutta—which the kindness of Dr. Frankland enables us to publish in another part of the present number of the JOURNAL—is the best exposition which has yet appeared of the exact relations of Professor Crookes's discovery to the modern practice of photometry. We need not repeat in detail the great expectations which were formed at one time, with much apparent reason, respecting the possible value, as a means of measuring light, of an instrument which was supposed to be moved by the action of light itself, and whose rate of motion seemed to depend directly and solely on the intensity of the light to which it was exposed. In this discovery of a motive power in light the germ of the most perfect of all possible photometers seemed to lie, only waiting the slight additions necessary to embody the principle in a workable form. But it is now evident, from Professor Pedler's account of his experiments in this direction, that there are causes of disturbance and error in the radiometer itself and in the conditions under which it must be used as a working implement, which render its indications too irregular to be trusted as a measurer of light. The effect of temperature on the extremely rare medium which fills the radiometer-bulb is shown by Professor Pedler to be almost as abnormal as the functions of the instrument itself, and it would be impossible to rely, however tentatively, upon the indications of any particular radiometer until the constants due to its own structural peculiarities had been determined, with some accuracy, by long and difficult experiment. The net result of Professor Pedler's labours, which were most carefully directed to the avoidance of all prejudice or preventible error, seems to be that when the peculiar requirements of a radiometer-photometer are most scrupulously observed, its records are at best only to be taken as approximately correct, when compared with the candle-photometer. Such a conclusion must be held as entirely condemnatory of the apparatus in question. We know that the ordinary photometrical method gives results only approximately true, and what is wanted in its place is not another method of similarly incomplete character, but one which shall be positive, and free from the risk of error which must always be present when the personality of the observer plays such an important part in the determination of the result, as it does in the present system. The radiometer appeared to offer a possibility of immunity from this personal element, and if this could have been secured without counterbalancing dangers a great advance would have been made in the exact measurement of the power of light. But we must now cease to expect that this desirable end will be attained by the agency of the radiometer, for although it is perfectly mechanical in its action, it has been shown to possess a multiplicity of defects, apparently inherent and insurmountable, which render its use as a photometer chimerical.

In the Chemical Section of the British Association, at present in session at Swansea, the most important paper connected with the gas industry yet read is the "Report on the "Best Means for the Development of Light from Coal Gas "of Different Qualities—by a Committee consisting of Dr. "William Wallace (Secretary), Professor Dittmar, and Mr. "John Pattinson, F.C.S., F.I.C.—drawn up by Mr. Pattinson." This, which is the second report of the Committee appointed to inquire into the subject, was read on Thursday. The report deals with the best methods of burning common gas, averaging from 14 to 16 candles in illuminating power. The experiments show that, with union-jet and batswing burners supplied with 16-candle gas, as the pressure is increased the illuminating power of the flame improves up to a certain point, and then declines, per unit volume of gas consumed. In the case of each burner there is a particular consumption and a particular pressure which give the best results. Experiments on heating coal gas before it is brought to the burner show that but little effect is produced when the gas is raised to 350° Fahr. before issuing from the orifice. When the air-supply is heated to 520° Fahr. and this hot air is brought into the bottom of an Argand burner closed against other air supply, the illuminating power of the flame was increased from 16 to 17½ candles. The increase of light would not, however, compensate for the extra cost of plant and fuel. The various devices for regulating the gas supply issuing from the burner were tested, the results being given in tabular form. We shall next week print the report, *in extenso*, together with the tables which accompany it.

The presiding magistrate at the Lambeth Police Court, Mr. Ellison, recently had before him a case of alleged conspiracy to defraud the South Metropolitan Gas Company, which presents features that we are glad to think are unusual. The defendants, four in number, who may be described as a gas consumer, the consumer's father, his business manager, and a gas-fitter, were charged with conspiring to enable the consumer to obtain gas without payment, by tampering with the meter. It was stated that the tempter, who suggested the fraud, was the gas-fitter—Joseph Horton—who, it is scarcely necessary to state, was a workman in search of a job, and apparently not particular as to the nature of his work, from the point of view of abstract morality, so long as it was sufficiently profitable. He appears to have approached, in the first case, the defendant Carman, the elder, who keeps a public-house in the neighbourhood of the Haymarket, with the offer to save him a great deal of gas, if he used a wet meter. Carman, however, was unable to profit by the gas-fitter's arts, as his own meter was a dry one; but he recommended him to his son, who is a billiard-table keeper in the New Kent Road, and whose meter was of the species available. Here the operation in question—which consisted in piercing a small hole in the drum of the meter, through the plug-hole for the discharge of superfluous water, and thus providing a passage for a certain quantity of gas without registration—was alleged to have been effected by the defendant Horton, for a consideration to be paid by the elder Carman, of course with the knowledge and connivance of the other defendants, who were on the premises when the act was committed. Thus far extends the evidence of the plumber's labourer, who was a party to the whole affair, but who eventually, in consequence of some dispute, went into the witness-box against them. The man Horton failed to pierce the drum of the meter, if such had been his intention, but as stated by the Company's Inspector (Mr. Charles Howard), the guard plate immediately in front of the drum had been perforated in two places, by some means other than could have been adopted with the object of making any possible repairs, or under any other

lawful pretence; although it was not clear that gas had been actually abstracted. On the evidence before him, the magistrate committed the defendants for trial at the next Surrey Sessions, admitting the Carmans and Phillips to bail in their own recognizances, while severer conditions were imposed upon Horton. The case being, therefore, *sub judice*, we can make no further comment on it than to repeat that it is of uncommon character, and is not likely to form the commencement of a series of attempts on the internal mechanism of meters, for, as shown by the evidence, the alleged intention to defraud was unsuccessful, and from the conditions of the case could not well be otherwise than a failure; while if it had succeeded discovery must ultimately have been certain.

A quarterly meeting of members of the Manchester District Institution of Gas Engineers, held at Halifax on Saturday last, was well attended, and the proceedings were very interesting. The members and their friends were met at the Corporation Gas-Works by Mr. Carr, the President, who conducted them over the establishment, which is managed by him with so much of credit to himself and advantage to the town. The works present a remarkable example of a difficult site turned to good account, the shape of the ground being most peculiar, while the differences in level that mark its section are somewhat extraordinary, and although not altogether objectionable for some reasons, the expenditure of capital necessitated in order to adapt them to useful purposes has been very heavy. Under Mr. Carr's direction the works have lately been much extended and brought up to the standard of modern requirements, the new buildings and apparatus being very substantial and commodious. Before leaving the works the members were entertained at luncheon, served in the new purifying-house, wherein six purifiers were in use at the time, a circumstance which it may be regretted that Dr. Ballard, the chronicler of gas manufacturing nuisances, was not present to take a note of. Among the invited guests was the Chairman of the Gas Committee of the Corporation (Alderman Riley), who bore testimony to the flourishing state of the gas affairs of the town, and intimated that a gratifying change in the administration of the finances, leading to a substantial reduction in the price of gas, might shortly be looked for. The business of reading papers, with the usual discussions thereon, subsequently occupied the members, the chief interest centring in a communication by Mr. Eastwood, of Batley, on "Coal Seams," which was of more than local importance. This, with the other papers read, will appear in our columns in due course.

Mr. D. M. Nelson's paper on "Gas Purification by Oxide of "Iron," read at the last meeting of the North British Association of Gas Managers, was admirably adapted to the purpose for which it was intended—to explain in detail the use of this purifying material to a body of practical men, to whom the process is somewhat unfamiliar. It seems a trifle late in the day to enter into an advocacy of a material which has so thoroughly established itself in all large gas-works as oxide of iron. It may, indeed, be styled a gas manager's friend, since its use as a purifying agent is so easy and free from annoyance. Its chief drawback is that it cannot do certain things which are, in most important establishments, considered necessary; but beyond this, nothing can be urged to its detriment. In large works it is, as we have said, a reliable and much-valued agent, while in small country works, although the need for its employment may not be so imperative, it is difficult to see how it can fail to give satisfactory results when properly used.

Mr. F. T. Linton's communication on "The Cost of Working "a Gas-Engine" was a valuable record of facts compiled by one who had special facilities for observing them, and skill to compile them in an acceptable form. The advantage shown in favour of the gas-engine as compared with a steam-engine of equal power is very remarkable, and the data on which the comparison is made can scarcely be questioned on grounds of partiality for the former. A possible saving of nearly £27 per annum in regard to gas over steam for the production of $3\frac{1}{2}$ horse-power nominal, is not likely to be overlooked by the users of power in a small way, a class of the trading and manufacturing community that tends to grow larger every year. It is needless to say that this economy is principally effected in the item of wages for attendance, in which the gas-engine possesses advantages greater even than can be valued in money. And when to this is added the many other valuable points to the credit of the gas-engine, such as its greater immunity from risk of fire and explosion, and the absence of dirt and smoke—all capable of appraisement in actual cash—a case is made out for it beyond the power of steam to rival.

Water and Sanitary Notes.

The Metropolitan Water Examiner, Lieut.-Col. Frank Bolton, has been extending his inspectorship to the tanks, cisterns, and water-butts of the private consumers, and has found them in many cases to be in a state which suggests a scathing satire on the doctrines and teachings of the water purists. While these are "straining at gnats," the poor of London —and some of the rich—are "swallowing camels." Dr. Frankland has seen "moving organisms" in the water drawn from a stand-pipe; but Lieut.-Col. Bolton has looked into the house tanks and seen old rags, dirty rubbish, rotten lids, garbage, "dead puppies and kittens, with an occasional cat." To "make clean the outside of the cup and platter" is an old delusion. So with the water inspection of the Metropolis. The big reservoirs must be kept scrupulously clean; but the innumerable little ones may be as foul and filthy as neglect and mismanagement can make them. If water as drawn from the mains can occasionally kill, what must be the slaughter that proceeds from the cisterns?

That portion of the undertaking of the Barnet District Gas and Water Company which relates to the supply of water, appears to be entering on a prosperous phase. The capital outlay of the Company has been large, owing to the scattered nature of the district; but the rental is now increasing, and there is an ample supply of water for disposal to meet the requirements of future customers. The water rents during the past half year amounted to £3083, leaving a balance to profit and loss account of £1500 net revenue. The capital expended on the water-works is £73,000. Mr. James Glaisher, F.R.S., the Deputy-Chairman of the Company, stated at the half-yearly meeting held last week, that they were not sending out one-third the quantity of water they could distribute, and they had been duplicating their machinery, so that if part should get out of order, the other would keep up the supply of the district.

The Padiham Local Board appear to be giving to their district a supply of water which is not all that could be desired. One of the consumers having repeatedly complained, and having been told from time to time that the Board would take steps to purify the water and increase the supply, has at last placed the matter in the hands of his solicitors, with an intimation that he will not submit to be supplied any longer with water "offensive and bad," as that which he is at present doomed to receive. He wishes to know "what the "Board purpose doing." The Board have resolved to reply that they are "doing what they can." A long report addressed to the Board by their Water-Works Manager states: "The hot weather of the present month has caused "the water to have the usual offensive smell." A number of service-pipes have been stopped up with moss derived from the bed of the reservoir, in addition to which there is an evident risk of the total supply falling short. "The water-"works were constructed in 1854," says the Manager, "and "the area of the gathering-ground remains the same." Certain "negotiations" are going on, which it is hoped will make things better. An application is to be made to Sir Ughtred Kay-Shuttleworth for permission to lay down some pipes on his property, and as Sir Ughtred has shown great interest in the Water Supply of London, we presume he will do his best for Padiham.

The people of Moorside and its neighbourhood, in the vicinity of Oldham, were complaining bitterly some time ago of the "really awful condition" of their water supply, but have lately been delivered from all trouble and anxiety in this respect by the effectual filtration of the liquid. The population is small, numbering only about two thousand, and the filter employed at the works is capable of purifying as much as four thousand gallons of water an hour. The filter is known as Bell's patent, and the Moorside people appear thoroughly satisfied with its operation. It is reported that the patentees are putting down a large filter of this description at Pilkington, and should the system prove effectual in that instance, it is expected that it will be extensively adopted. A suggestion is put forth that the Oldham Corporation might confer a benefit on the water consumers of their jurisdiction by inquiring into the merits of this new device.

The inhabitants of Fulwood, a district lying outside Preston, complain of the charges levied upon them by the Preston Corporation in respect to their water supply. The Corporation are accused of having a "spite" against Fulwood, because it recently refused to be absorbed into the borough. As a measure of defence, the Fulwood Local Board have prepared a scheme for an independent water supply, under the advice of the well-known geologist, Mr. De Rance. At a public meeting held the other day at Fulwood,

the conduct of the Preston authorities was keenly discussed, but before taking steps to obtain an independent supply, it was resolved to send a deputation to wait on the Corporation, in the hope of settling the question amicably.

The proceedings of the Lower Thames Valley Main Sewerage Board continue to cause anxiety to the ratepayers of the district. A few days ago it was discovered that a Bill called the "Local Government Provisional Orders (Bethesda, &c.) "Bill," which contained a Provisional Order granted to the Thames Valley Board by the Central Authority, was down for a second reading in the House of Lords, and that Lord Colchester would move the insertion of a clause whereby the Local Government Board would be enabled to authorize the payment by the Thames Valley Board out of the rates of the £7000 or £8000 expenses incurred in the attempt to carry the Bill promoted in Parliament last year by the latter body. Lord Colchester's motion was, in fact, nothing less than an attempt to get the House of Lords to reverse a decision of the Master of the Rolls, who had decided that the payment of the costs out of the rates would be illegal. A deputation from the Kingston Town Council to Lord Redesdale was hastily formed on the very day when the second reading of the Bill was to take place. Lord Redesdale was seen, a petition was presented, and in the end Lord Colchester withdrew the motion of which he had given notice, saying, in doing so, that he was not aware the clause would meet with any opposition. In the House of Commons questions have been asked as to the report of the Inspector who conducted the protracted inquiry into the Molesey scheme. Mr. Brodrick wished to know from the President of the Local Government Board what conclusion had been arrived at, and also why it was that the report had not been made public. Mr. Warton went a step farther, and asked whether the report of the Inspector, after forty-five days spent in receiving evidence, was not condemnatory of the scheme which had been brought forward. Mr. Dodson, in his reply, signified that the time had not arrived for answering these interrogations. Three days afterwards, Mr. Brodrick asked for a guarantee that the decision of the Local Government Board would be announced at a time when the attention of Parliament might be called to it. The honourable member was then told that as nothing could be done without a Provisional Order, the House would have ample opportunity for discussing the subject. In the course of his replies, Mr. Dodson said it had been found necessary to refer the report back to the Inspector "for further ex- "planation." This statement has created some apprehension that private influence is being brought to bear in favour of Colonel Haywood's scheme. A local contemporary, in discussing the subject, says: "It is not, we fear, improbable "that the public may be startled with a scandal in social "legislation." It is stated that the recent inquiry conducted by Mr. Harrison will cost the ratepayers £20,000.

The Banbury sewage farm does not appear to effect all that is required for the benefit of the Cherwell. Several farmers and others, resident on the banks of the river for some miles below the town, have sent a memorial to the Local Board of Health, stating that during the last two months the Cherwell has been "in a most offensive condition," and that "large "quantities of fish have been destroyed by the sewage matter "that has come down from Banbury." Some years ago the Banbury authorities were subject to legal proceedings on account of the discharge of sewage into the river, and matters went so far that the town property was very nearly becoming sequestrated. The establishment of the sewage farm followed, and for some time it answered admirably. Possibly the heavy and frequent rains of the past summer so saturated the soil as to render the application of the sewage somewhat difficult. If so, a good precipitation process would have been found valuable as an adjunct. Complaints are also rife in respect to the Medway, where it is said thousands of fish have been poisoned in the course of ten days, the mischief being attributed to the discharge into the river of a noxious liquid from some paper mills. In this instance the Authorities of the district appealed to the Local Government Board to send down an Inspector to make an inquiry, and advise them how to proceed. The Board replied, asking whether it was the wish of the Authorities to proceed against the offenders under the sixth section of the Rivers Pollution Act. After considerable discussion, the Local Authorities resolved to inquire farther into the facts of the case. It appears to be the wish of the Maidstone Local Board that the parties who now pollute the stream should make use of subsiding tanks, so that the liquid might not pollute the river. In this way, it is suggested, "expensive litigation may be avoided." The case is, apparently, one which will put the utility of the Rivers Pollution Act to a practical test.

THE ACCOUNTS OF THE METROPOLIS GAS COMPANIES FOR 1879.

We publish to-day, according to the promise recently made, a tabular abstract of the accounts of the Metropolis Gas Companies for the past year. The process of amalgamation has in some measure affected the symmetry of the statement, especially as regards the value of the evidence it gives respecting the working results of the amalgamated Companies as compared with those of the previous year. This is, however, a consideration of small moment, the value of the record as it really exists being plain.

From it we gather that the amount of capital and borrowed money involved in the great work of supplying gas to the whole of the Metropolis reached the grand total of £12,681,818, the employment of which at the remunerative rates of interest which it has yielded for many years past, in this particular industry, is perhaps one of the most striking illustrations of the peculiar conditions of modern social existence.

The detailed statistics of the working of the five Companies are worth some attention. The first thing noticeable on comparing the table wherein the various items of account are reduced to the unit of coal carbonized, with the similar table for the previous year, is that the capital and borrowed money of all the Companies is less, the decrease ranging from nearly 20s. per ton in the case of the London Company to about 1s. 9d. only as with the late Phœnix Company. The capital and working statements of the South Metropolitan Company, including as they do six months independent working of the Surrey Consumers Company, can hardly be compared with earlier returns, compiled when the two Companies were distinct. The income of all the Companies, except the South Metropolitan, was less last year, on the same basis of comparison, than in the year previous; and the same may be said of the expenditure on revenue account. The gross profit per ton of coal for the year was—Chartered, 13s. 1·14d.; Commercial, 11s. 3·19d.; London, 9s. 5·60d.; Phœnix, 12s. 1·99d.; South Metropolitan, 11s. 10·36d.; mean of the whole, 12s. 5·28d., which is 4·23d. less than the average of the year before—a result which must be considered remarkably even for two years operations of such magnitude, and depending on factors which are all of them more or less variable.

Glancing through the figures representing the total increase or decrease of the Companies business under the chief heads of income and expenditure, we find, of course, a general increase in the sales of gas by meter, the most striking comparison between the two years being in the case of the London Company, which last year had an increase of £23,281 as against £710 increase in 1878. The decrease in the amount realized for residuals, which was such a striking feature of the returns for 1878, gave place last year to an increase of £44,211, which was more than double the amount required to make up for the previous year's deficiency. In the case of the Chartered Company the increase, curiously enough, was within a few pounds of the previously recorded decrease.

Statistics, we are frequently told, can be made to prove anything, and in the table before us there is much to exercise the ingenuity of any one who may wish to pick a hole in the management of any of the Companies represented. But our readers do not require to be reminded that comparative statements of working results, such as the one in question, however interesting in themselves, are qualified to assist an inquirer into the position of the undertakings concerned only up to a certain point, beyond which other factors, impossible to tabulate, must be taken into account. In some things it is indeed possible to compare the operations of different works, or groups of works, with something like strict and sole reference to general principles, such, for example, as the results given in the following table, which shows, in the most concise form, what has been done in the retort-houses of the different Companies during the past year:—

TABLE *of the Residuals and Gas made, per Ton of Coals Carbonized, by the Metropolis Gas Companies in the Year* 1879.

Name of Company.	Coke per Ton of Coals, in Bushels.	Breeze per Ton of Coals, in Bushels.	Tar per Ton of Coals, in Gallons.	Ammoniacal Liquor per Ton of Coals, in Gallons.	Gas Made. Feet per Ton
CHARTERED	41·95	3·61	10·84	32·93	10,139
COMMERCIAL. . . .	46·14	4·11	9·08	32·81	10,191
LONDON	35·07	4·26	9·87	25·74	9,904
PHŒNIX	36·00	2·14	10·16	28·39	10,039
SOUTH METROPOLITAN	45·00	2·74	10·48	25·61	9,868
Mean per ton . .	41·43	3·48	10·52	31·16	10,088

The whole of the Companies, with the exception of the late

ACCOUNTS OF THE METROPOLIS GAS COMPANIES FOR THE YEAR 1879.

—	Chartered.	Commercial.	London.	Phœnix.	South Metropolitan.†	All the Companies.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Capital and borrowed money	9,096,771 1 4	690,000 0 0	860,359 15 0	1,208,000 0 0	826,688 0 0	12,681,818 16 4
Income—viz.:						
Sale of gas by meter	1,905,743 5 1	212,380 17 7	216,039 7 2	269,379 7 5	234,374 9 4	2,838,117 6 7
Public lights, including lighting and contracts	128,355 18 8	20,695 11 11	20,206 16 1	26,117 8 3	28,580 8 0	223,956 2 11
Meter-rents	36,485 15 8	4,221 13 10	4,391 12 11	6,129 2 4	5,466 1 0	56,694 5 9
Old materials	4,656 9 4	172 11 4	627 14 9	1,577 19 3	264 5 6	7,299 0 2
Residual products	496,678 14 6	62,684 5 11	68,041 19 2	75,295 1 11	86,623 3 9	789,323 5 3
Miscellaneous	5,415 5 2	305 8 7	2,701 13 0	2,495 4 4	461 15 7	11,379 6 8
Total income from all sources	2,577,335 8 5	300,460 9 2	312,009 3 1	380,994 3 6	355,970 3 2	3,926,769 7 4
Expenditure—viz.:						
Coals, including carriage and dues	929,181 18 10	117,365 12 10	110,902 15 7	136,737 11 7	125,638 9 7	1,413,826 8 5
Purifying materials, including labour	57,175 18 0	7,309 13 7	4,282 2 8	4,273 5 10	6,866 8 10	79,907 8 11
Salaries and wages—manufacture	181,643 18 10	29,488 4 7	27,004 2 9	29,504 16 9	34,259 5 10	301,900 8 9
Wear and tear—manufacture	286,121 7 4	19,747 14 11	43,511 14 3	48,167 17 6	24,519 18 6	422,068 12 6
Rents, rates and, taxes	77,501 5 4	7,701 19 5	9,350 6 2	10,881 14 11	8,564 17 6	114,000 3 4
Salaries—management	12,041 4 1	1,530 13 4	2,594 4 8	2,476 8 11	5,043 9 4	23,686 0 4
Collectors commission	23,689 3 3	2,322 13 5	3,359 7 6	5,055 3 3	3,734 7 4	38,160 14 9
Stationery, printing, and general charges	9,591 7 5	1,857 18 3	2,026 14 0	2,443 12 0	2,975 9 5	18,895 1 1
Directors	7,500 0 0	3,200 0 0	2,500 0 0	3,000 0 0	11,355 14 0	27,555 14 0
Auditors	500 0 0	150 0 0	150 0 0	200 0 0	257 10 0	1,257 10 0
Salaries and wages, wear and tear—distribution	138,249 18 11*	21,371 19 0	26,178 11 3	23,175 10 2	18,874 16 8	227,850 16 0
Repair and renewal of meters	32,455 14 5	2,169 14 4	3,865 5 1	5,346 14 4	2,841 11 8	46,678 19 10
Law and parliamentary charges	3,267 10 0	921 14 9	847 15 5	1,052 8 2	584 17 6	6,674 5 10
Bad debts and extraordinary expenses	30,920 4 1	1,974 0 10	2,324 19 4	2,971 16 10	3,038 19 6	41,230 0 7
Total expenditure on revenue account	1,789,839 10 6	217,111 19 3	238,897 18 8	269,287 0 3	248,555 15 8	2,763,692 4 4
Gross profit	787,495 17 11	83,348 9 11	73,111 4 5	111,707 3 3	107,414 7 6	1,163,077 3 0
Do. per cent. on capital and borrowed money	8 13 2	12 1 7	8 9 11	9 4 11	12 19 10	9 3 5
Do. do. gas-rental	38 14 3	35 15 2	30 18 11	37 16 1	40 16 4	37 19 8

* This item includes the sum of £1369 2s. 10d. for experimental street lighting, and £415 7s. 8d. for experiments with the electric light.
† Including half year's independent working of the late Surrey Consumers Company, January to June, 1879.

TABLE *showing the Capital, Income, Expenditure, and Profit per Ton of Coal carbonized in* 1879.

—	Chartered.	Commercial.	London.	Phœnix.	South Metropolitan.	Mean of all the Companies.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Capital and borrowed money	7 11 3·16	4 13 3·18	5 11 4·78	6 11 6·77	4 11 3·65	6 9 2·67
Income—viz.:						
Total gas-rental	1 13 9·88	1 11 6·05	1 10 7·67	1 12 2·20	1 9 0·77	1 12 9·01
Meter-rents	7·28	6·85	6·82	8·01	7·25	7·28
Old materials	0·93	0·28	0·98	2·06	0·35	0·93
Residual products	8 3·11	8 5·67	8 9·72	8 2·40	9 6·80	8 5·31
Miscellaneous	1·08	0·49	4·20	3·26	0·61	1·46
Total income from all sources	2 2 10·28	2 0 7·34	2 0 4·79	2 1 5·93	1 19 3·78	2 1 11·90
Expenditure—viz.:						
Coals, including carriage and dues	15 5·41	15 10·37	14 4·32	14 2·87	13 10·52	15 1·46
Purifying materials, including labour	11·41	11·86	6·65	5·59	9·10	10·25
Salaries and wages—manufacture	3 0·24	3 11·83	3 5·96	3 2·57	3 9·40	3 2·75
Wear and tear—manufacture	4 9·09	2 8·03	5 7·61	5 2·96	2 8·50	4 6·17
Rents, rates, and taxes	1 3·46	1 0·49	1 2·53	1 2·23	11·35	1 2·63
Salaries—management	2·40	2·48	4·03	3·24	6·68	3·04
Collectors commission	4·73	3·77	5·22	6·61	4·95	4·90
Stationery, printing, and general charges	1·91	3·01	3·15	3·20	3·94	2·42
Directors	1·50	5·19	3·88	3·93	1 3·05	3·53
Auditors	0·10	0·24	0·23	0·27	0·34	0·16
Salaries and wages, wear and tear—distribution	2 3·59	2 10·66	3 4·67	2 6·21	2 1·02	2 5·34
Repair and renewal of meters	6·48	3·52	6·01	6·99	3·77	5·92
Law and parliamentary charges	0·65	1·49	1·32	1·38	0·77	0·65
Bad debts and extraordinary expenses	6·17	3·21	3·61	3·89	4·03	5·29
Total expenditure on revenue account	1 9 9·14	1 9 4·15	1 10 11·19	1 9 3·94	1 7 5·42	1 9 6·71
Gross profit	13 1·14	11 3·19	9 5·60	12 1·99	11 10·36	12 5·28

TABLE *showing Increase or Decrease in each Item during* 1879 *compared with* 1878.

—	Chartered.		Commercial.		London.		Phœnix.		South Metropolitan.		All the Companies.	
	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.
	£	£	£	£	£	£	£	£	£	£	£	£
Capital and borrowed money	370,271	..	..	..	..	3,654	46,000	..	36,688	..	449,305	..
Income—viz.:												
Sale of gas by meter	131,093	..	13,623	..	23,281	..	17,070	..	19,162	..	204,229	..
Public lights, including lighting and contracts	..	372	205	..	729	..	597	..	..	2,185	..	1,026
Meter-rents	1,177	..	63	..	168	..	166	..	16	..	1,590	..
Old materials	114	..	..	156	293	..	..	81	..	180	..	13
Residual products	26,899	..	3,526	..	6,833	..	..	2,155	9,108	..	44,211	..
Miscellaneous	..	324	..	530	..	468	..	126	..	281	..	1,730
Total income from all sources	158,587	..	16,731	..	30,836	..	15,468	..	25,640	..	247,261	..
Expenditure—viz.:												
Coals, including carriage and dues	65,148	..	3,586	..	6,553	..	3,927	..	5,185	..	84,399	..
Purifying materials, including labour	6,147	..	217	..	1,731	..	927	..	596	..	9,618	..
Salaries and wages—manufacture	6,882	..	1,362	..	2,639	..	695	..	1,151	..	12,729	..
Wear and tear—manufacture	12,920	..	1,679	..	17,656	..	1,910	..	1,150	..	35,315	..
Rents, rates, and taxes	..	3,416	1,327	..	..	1,324	626	..	..	427	..	3,213
Salaries—management	549	..	..	21	127	..	..	20	2,197	..	2,833	..
Collectors commission	332	..	183	..	251	..	420	..	233	..	1,420	..
Stationery, printing, and general charges	..	1,722	158	..	267	..	49	..	735	..	..	513
Directors	..	..	..	..	..	..	..	..	7,685	..	7,685	..
Auditors	..	..	..	..	..	..	..	..	52	..	52	..
Salaries and wages, wear and tear—distribution	10,358	..	5,491	..	8,005	..	567	..	1,691	..	26,052	..
Repair and renewal of meters	3,582	..	456	..	809	..	946	..	..	71	5,715	..
Law and parliamentary charges	..	567	540	..	298	..	897	..	526	..	1,694	..
Bad debts and extraordinary expenses	2,574	..	..	241	..	4,607	298	..	..	218	..	2,194
Total expenditure on revenue account	102,787	..	14,731	..	32,405	..	11,182	..	20,485	..	181,592	..
Gross profit	55,800	..	2,000	..	..	1,569	4,286	..	5,155	..	65,669	..
Do. per cent. on capital and borrowed money	0·28	..	0·29	..	..	0·15	..	..	..	12·46	0·19	..
Do. do. gas-rental	0·27	..	..	1·34	..	4·24	..	0·86	..	40·38	..	0·40

Phœnix Company, show a higher yield of coke per ton of coal carbonized than in 1878; the increase in the case of the Chartered Company being over 8 bushels. They also obtained more tar and ammoniacal liquor, but slightly less gas. In 1878 the Chartered Company headed the list as regards the make of gas per ton of coal; but last year the Commercial Company took precedence in this respect, though only by a small quantity. The South Metropolitan Company still as to quantity kept their place at the bottom of the list, the difference between the highest and the lowest being, however, little over 300 feet per ton.

In all respects, as we have already stated, the clear results of the two years working are remarkably close, and on the whole the past year must be acknowledged to have been a prosperous one for all the Metropolitan Gas Companies.

Communicated Articles.

ON THE AMOUNT OF LIGHT NAPHTHA IN COAL TAR, AND ITS PRACTICAL ILLUMINATIVE VALUE TO THE GAS MANUFACTURER.

By Mr. H. LEICESTER GREVILLE, F.C.S., &c.,
Chemist to the Commercial Gas Company.

Much has been written, and a considerable amount of discussion has taken place at one time and another, on the subject of the light naphthas produced during the manufacture of coal gas, and on the value to the gas maker of retaining them as far as possible in the gas, in place of allowing them to be, in great measure, retained by the tar. With such a degree of interest evidently attaching to the question, it is surprising to find that few, if any, experiments have been made on the principal points most bearing on the subject. Assuming that it is desirable to utilize all the light hydrocarbons produced in gas manufacture, in order to develope the greatest possible light in the gas, there are two points which require special attention, and upon which the whole question rests. These points are: Firstly, what is the available amount of these light naphthas which the ordinary gas manufacturer has at his disposal to increase the illuminating value of his gas; and, secondly, what is the absolute increase in lighting power obtainable from the expenditure of a certain quantity of light naphtha. On the first point, I do not remember having seen any published information, and on the second point there existed, I believe, a similar lack of information, when the *resumé*, by Mr. G. E. Stevenson, of Dr. Knublauch's experiments was given in the last number of the JOURNAL. These experiments record the illuminative value of benzol, which may be taken as the principal constituent of coal tar naphtha, while my own experiments in this branch of the subject (which I may here state were completed before the publication of Mr. Stevenson's paper, and in complete ignorance of Dr. Knublauch's results) were purposely conducted on the crude naphtha, in order to have as exact an analogy as possible between my experimental data and the practical operations of the gas maker.

When my attention was first directed some time back to the subject of the Aitken and Young process of gas-making, I was desirous of placing myself in a position to form a reliable opinion on the value of a method from the use of which such valuable results are claimed. In the first place, there is one point in the various discussions which have taken place on the subject, which I cannot help thinking has been somewhat overlooked—viz., that the practical value of any process, the object of which is to transfer light hydrocarbons from the tar to the gas, is represented, not by the gain to the gas alone, which appears to be the general view taken, but by the balance of the difference between the increased value of the gas on the one hand and the diminished value of the tar on the other. Robbing the tar of its light naphtha means broadly, that the tar distiller would be deprived of the special product which gives the tar its principal value—viz., the benzol, which is the source of the aniline colours of commerce. It is indeed an open question—in the event of any process being adopted by a large number of gas companies which deprived the tar of its light hydrocarbons—whether the consequent increasing scarcity of benzol would not so augment the commercial value of naphtha-laden tars as to make it more remunerative for the gas manufacturer to gain any desired increase of lighting power by the use of extra cannel, and dispose of the produced tars with their full complement of naphtha, and consequently of benzol. However speculative such views may seem at present, it may be at least anticipated that the extensive adoption of any process which deprives commercial tar of its benzol, would rapidly lead to an augmentation in the value of the last-named substance, producing a corresponding increase in the value of any such source of benzol as naphtha-laden tars.

Having called attention to this point, which is certainly worthy of serious consideration, it remains to record the results of the experiments which I have made with reference, firstly, to the amount of light naphthas which are available for transfer from the tar to the gas, at an ordinary works where common coal is used with a small percentage of cannel; and, secondly, as to the illuminative value of such naphtha when so transferred to the gas. Whilst making experiments on the first point, I thought it would be advisable, in the absence of all data on the subject, to make an examination of the different tars deposited at all available points in the condensing and purifying plant, with reference to the amount of light naphtha which they contained, in addition to making a series of determinations of the percentages of light naphtha in the stock tars as sold from the works. These last-named samples, of course, represent the mean of all the various tars produced at the different portions of the plant. With this view I obtained various samples from three different works. The samples represent tar drawn from the following points:—The hydraulic main; the end of the circuitous length of pipe proceeding from the hydraulic, and along which the tar condensed in the hydraulic flows; the condensers; the washers; and one sample from a scrubber in which the coke had remained for some time without being changed.

The following table shows the results obtained, and in addition the percentage of light naphtha in the stock tars, as representing the ordinary commercial product as it leaves the works:—

	Where from.	Specific Gravity of the Tar.	Percentage by Volume of Light Naphtha.	Specific Gravity of the Crude Naphtha.
No. 1 Works.	Hydraulic main	1·220	Mere trace.	—
	End of pipe in connection with hydraulic	1·220	1·2	·961
	Condensers	1·143	7·6	·910
	Do.	—	6·6	·908
	Washers	1·137	13·0	·912
	Do.	—	13·5	·904
	Stock	1·217	2·7	—
	Do.	—	3·2	·901
No. 2 Works.	Condensers	1·188	3·5	·954
	Washers	1·142	7·3	·923
	Stock	1·223	1·1	·939
	Do.	1·225	1·6	·961
	Do.	—	2·0	·922
	Do.	—	0·3	—
	Do.	—	1·0	—
	Do.	—	1·0	—
No. 3 Works.	Condensers	1·149	7·5	—
	Washers	1·109	13·0	—
	Do.	—	9·3	—
	Scrubber	1·103	9·3	—
	Stock	1·210	2·5	—
	Do.	1·205	2·1	—

The following table places the figures more concisely, giving the average when more than one sample was tested:—

Where from.	Specific Gravity of the Tar.	Percentage by Volume of Light Naphtha.	Specific Gravity of the Crude Naphtha.
Hydraulic Main	1·220	Mere trace.	—
Hydraulic extension	1·220	1·2	·961
Condensers	1·160	6·3	·924
Washers	1·129	11·2	·913
Scrubber	1·103	9·3	—
Stock	1·215*	2·6*	·930

* These figures are the mean of the samples from works Nos. 1 and 3. I have omitted the samples from work No. 2 for reasons which will be explained further on.

With reference to the figures in the table, it will be noticed that as the samples of tar are taken at increasing distances from the retort, the specific gravity becomes less, and the percentage of light naphtha more—the specimen from the scrubber alone excepted. The fluidity of the specimens was also greater as the amount of light naphtha increased. The specimen of tar from the hydraulic main was so thick when cold that it would scarcely pour from the containing vessel, while the samples which gave 13 per cent. of naphtha were as fluid as black varnish. The high specific gravity of the naphthas as compared with benzol was due to their containing a large quantity of naphthaline. One point deserving special attention is that the tar from the hydraulic main contained no appreciable quantity of light naphtha, while the same tar, after flowing along with the gas through some 350 feet of horizontal main attached to the side of the retort-house, contained 1·2 per cent. This result may be considered either as due to the prolonged contact of the tar with the gas, or may be an effect simply due to condensation, the temperature at the outlet of the hydraulic main being 130°, and at the end of the 350 feet length of main 104°. The absence of any estimable quantity of light naphtha in the hydraulic main tar seems also to show that at the temperature there found (130°), and under the ordinary conditions of gas manufacture, naphtha is neither condensed nor is it absorbed by the tar. In the event of any process by which it is proposed to transfer the light naphthas from the tar to the gas, it would seem by far the better plan to allow the tar condensed in the hydraulic main to flow directly away to a special receptacle, and to collect apart the tars subsequently condensed in the remaining portions of the plant, and which are comparatively rich in light hydrocarbons, for subsequent treatment in an analyzer or other apparatus suitable for effecting their transfer to the gas. This plan would minimize the expense of the requisite apparatus, inasmuch as a comparatively small quantity of tar would have to be dealt with, and a correspondingly small apparatus employed.

At works No. 2 the plan has been adopted of drawing off the tar direct from the hydraulic main, under the impression that the diminished contact of the tar with the gas would tend to the retention of light hydrocarbons by the latter. It is in consequence of this treatment that I have omitted the samples of the stock tars in giving the mean percentage of light naphtha in the second table. On reference to the actual figures showing the percentages of naphtha in the stock tars from works No. 2, it will be seen that the amounts are *less* than those shown in the examination of the other samples

from works Nos. 1 and 3. Whether this arises from the withdrawal of the tar at the end of the hydraulic main, or from other causes, I am not prepared to say, but I may state that a general impression prevails at the works that the illuminating power of the gas has been greater since the adoption of the new plan.

With regard to the remaining figures in the table, the only facts worthy of note appear to be that samples of tar were met with containing as high an amount as 13 per cent. of light naphtha, and that as much as 7·5 per cent. was found in ordinary condenser tar. As these figures were obtained from the analyses of samples taken in comparatively warm weather, it is probable that they represent minimum quantities, and that during the winter months the percentages of light hydrocarbons would be found considerably higher.

In my next article I shall endeavour to show what is the absolute light-giving value of the light hydrocarbons to the gas manufacturer when retained in the gas, the estimate being based on the percentage of naphtha found in the stock tars.

ON THE USE OF THE RADIOMETER AS A PHOTOMETER.

By Mr. Alexander Pedler, F.C.S. (London and Berlin), F.I.C., Professor of Chemistry, Presidency College, Calcutta.

In a paper "On the Mechanical Action of Light," by Mr. Crookes,* written about four years ago, and which gave a sort of summary of the results obtained with the radiometer, a few photometrical experiments with the instrument are given, and from them it is concluded that the radiometer is a perfect photometer. The author says: "By this means photometry becomes much simplified; flames the most diverse may readily be compared between themselves, or with other sources of light. A standard candle can now be defined as one which, at x inches off, causes the radiometer to perform y revolutions per minute (the values of x and y having previously been determined by comparison with some ascertained standard); and the statement that a gas-flame is equal to so many candles may, with more accuracy, be replaced by saying that it produces so many revolutions." This conclusion being of great practical importance, and as the experiments on which it was based were very few in number, it appeared to be advisable that they should be, if possible, confirmed by a more extended series of observations.

It being part of my regular work to test the illuminating power of the Calcutta gas, I made a series of observations with the radiometer, comparing it with a standard gas-flame, whilst I was at the same time determining the illuminating power by the ordinary photometric method, as prescribed by the London Gas Referees. My first results were embodied in a note read before the Asiatic Society of Bengal, and published in their Proceedings for August, 1876. The conclusions at which I arrived were not very favourable to the use of the radiometer as a photometer, and one great cause of the discrepancies of my results was apparently to be found in the friction of the instrument. In the paper referred to I say: "It will be seen that these results agree very closely with those calculated according to the law of inverse squares; that is to say, the number of revolutions of the radiometer will be inversely proportional to the square of the distance from the source of light. But it will also be noticed that there is one marked exception to the rule, and that is at a distance of 10 inches from the gas-flame, where the rapidity of revolution is great. Here the actual number of quarter revolutions amounted to 59 36 per minute, whilst theoretically they should have been 90. Evidently when the radiometer is rotating rapidly there must be an immense increase in the friction, so as to reduce the rotation by one-third of the whole amount. There are also indications that when the radiometer is rotating very slowly, there is a considerable disturbance from the theoretical rate of revolution, probably showing that friction has much influence both when the rotation is slow and rapid." My general conclusions on Mr. Crookes's proposal to use the radiometer as a photometer were summed up in the following paragraph in the same paper:—"It is, I think, evident, from these experiments, that it would be impossible to say that because a radiometer rotated 16 times as rapidly with one flame as it did with another, the former flame possessed 16 times the illuminating power of the latter; for it must be seen that in working with either a very high or a very low rate of revolution, there appears to be considerable disturbance due to the friction of the instrument. It is, I believe, possible and even probable that much better results will be obtained by working the radiometer always to a fixed number of revolutions (say about 30 or 40 quarter revolutions per minute), and by altering the distance of the flame until such rapidity is obtained; in this way the friction of the instrument would be reduced to a constant quantity, and the comparative luminosities would be judged by the squares of the distances."

In the hope of proving the feasibility of this method of procedure, I have carried on a series of experiments with the Calcutta gas for more than two years, testing the illuminating power simultaneously by the ordinary photometric method and by the radiometer. The method of procedure was very simple. The instrument used was an ordinary radiometer with four aluminium vanes blackened on one side. The vanes rotate on a steel point, which is supported in the usual glass cup. The glass globe of the radiometer is about 6 centimètres in diameter, and it stands about 18 centimètres from the table. The radiometer was placed on a table which was graduated in centimètres, the zero point of the scale being made the centre of the radiometer. A standard Argand burner was so arranged that the centre of the flame was as nearly as possible at the same height as the vanes of the radiometer, and by means of a test meter exactly 5 cubic feet of gas per hour were burned in the jet. The burner was then moved towards or away from the radiometer until the vanes made exactly 15 whole revolutions or 60 quarter revolutions per minute. This number was selected as being most convenient, for by having a clock in the room audibly beating seconds, it was easy to see whether the rapidity of rotation was correct or not. The radiometer having then attained a constant speed of 60 quarter revolutions per minute, the distance of the centre of the flame from the central pivot of the radiometer was noted. No extraneous light was allowed to reach the radiometer, for all other flames which were burning in the room at the time of determination were either enclosed in the photometer or their light was screened off in some similar way. At the same time, and from the same supply-pipe, the illuminating power of the gas was determined by the photometrical process adopted by the London Gas Referees. In this process the illuminating power, as is well known, is corrected both for the temperature and pressure of the gas at the time of the experiment, the standard of 60° Fahr. and 30 inches pressure being adopted. In this way a large number of values were obtained for this particular radiometer, the experiment for each day showing that a certain distance of the standard flame from the instrument was equal to an illuminating power of so many candles.

To compare each day's experiment with others, I calculated from the numbers obtained what should have been the distance of the standard light from the radiometer if the gas had possessed an illuminating power of 12 candles. The calculation is, of course, a simple one, the distances being directly proportional to the square roots of the illuminating powers. Very considerable variations were, however, found in the numbers thus calculated; but I still persevered with the experiments until I had obtained between 250 and 300 results, which I thought would be sufficient to show the causes of these variations. I did not, of course, expect to obtain a perfectly exact agreement of the results of the photometer with the radiometer, for there is no doubt that the photometric method, though much improved, still does not give absolutely reliable results. This is inherent in the method itself, and it can scarcely be said to be capable of giving results nearer than *plus* or *minus* half a candle. In the second place, the colour of a gas-flame is known to vary somewhat, being sometimes comparatively white, but generally degenerating into a very decided yellow, and Mr. Crookes* has pointed out that different coloured rays have different actions on the radiometer. At first I was inclined to ascribe the differences I obtained to the above two causes; but as my experiments multiplied, and especially as the seasons here changed from the so-called cold weather to the hot weather and rains, it appeared that another and more serious cause affected the results. It appears clearly from my experiments that at the comparatively high temperatures which obtain here during the hot-weather months, the radiometer which I have used is very much less sensitive than at lower temperatures.

In all the experiments which I have made, I have recorded the atmospheric temperature and pressure; but, so far as I can see, it is practically impossible that the slight differences of atmospheric pressure which obtain here can have any effect on the rotation of a radiometer. No attempt has, therefore, been made to connect the changes in the sensitiveness of the radiometer with changes of atmospheric pressure. The readings of temperature are, however, important, for it is clear that, with every change of temperature, there will be an alteration in the tension of the residual gas in the radiometer. It is unfortunate that, working in a comparatively small room, as I have had to do, with sometimes three or four gas-jets burning, as well as the standard candles, it has been practically impossible to keep the atmospheric temperature constant. I have usually read the thermometer immediately on making the determination with the radiometer; but as the temperature was constantly though gradually rising, the exact temperature of the experiment is a little doubtful, for the temperature of the air and of the radiometer during the actual experiments may have varied by a degree or more from the observed temperature. It is clear also that the action of the light on the radiometer will be to raise its temperature, and this will be another disturbing cause which it is impossible to overcome. To eliminate any such slight doubt as the actual temperature at which the experiments have been made in the table below, I have grouped the experiments for every five degrees (Fahrenheit) of temperature. Starting with the lowest temperature which we have here of about 66°, the first group will be from 66° to 70°, the second from 71° to 75°, the third from 76° to 80°, and so on:—

Temperature of Air at Time of Experiment. — Deg. Fahr.	Number of Observations made between these Temperatures.	Calculated Distance of Standard Flame of 12-candle Power from the Radiometer in order to produce 60 Quarter Revolutions per Minute.	Differences.
66 to 70	3	54·5 centimètres.	—
71 „ 75	28	51·7 „ „	2·8 centimètres.
76 „ 80	25	49·5 „ „	2·2 „ „
81 „ 85	51	47·8 „ „	1·7 „ „
86 „ 90	91	43·6 „ „	4·2 „ „
91 „ 95	56	40·1 „ „	3·5 „ „
96 „ 100	8	36·8 „ „	3·3 „ „

It will, I think, be clearly seen from these numbers that the radiometer used in these experiments is much more sensitive at low than at high temperatures. At temperatures of 71° to 75° Fahr., with 12 candle power gas, to obtain 15 rotations of the radiometer per minute, the gas-flame is placed at 51·7 centimètres distance; but with the same amount of light to obtain the same velocity of rotation at a temperature of from 96° to 100° Fahr., it is necessary to

* *Quarterly Journal of Science*, July, 1875.

* Proc. Roy. Soc., xxiv., p. 279.

put the light as close as 36·8 centimètres, or about two-thirds of the above distance. It will also be noticed that for every rise of 5° Fahr. there is a continued and fairly steady decrease in the distance at which the light must be placed to obtain the same rapidity of rotation. The numbers from which these figures are calculated are too numerous to include in this paper; but, as examples of them, the experiments made at two temperatures may be given. These will show the extent of the variations in the observations at each temperature, and they will again clearly show that the radiometer is much more sensitive at low than at high temperatures:—

Temperature of Air at Time of Experiment (*i.e.*, Temperature of Radiometer) = 86° Fahr.			Temperature of Air at Time of Experiment (*i.e.*, Temperature of Radiometer) = 92° Fahr.		
Illuminating Power of Gas-Flame as determined by Photometer, in Standard Candles.	*Observed* Distance from Radiometer to cause it to Revolve 15 times per Minute, in Centimètres.	*Calculated* Distance of Gas-Flame of 12-candle Power from Radiometer to cause 15 Revolutions per Minute, in Centimètres.	Illuminating Power of Gas-Flame as determined by Photometer, in Standard Candles.	*Observed* Distance from Radiometer to cause it to Revolve 15 times per Minute, in Centimètres.	*Calculated* Distance of Gas-Flame of 12-candle Power from Radiometer to cause 15 Revolutions per Minute, in Centimètres.
13·00	46·4	44·6	12·63	41·2	40·2
14·44	50·2	45·8	14·07	43·8	40·4
14·40	48·8	44·6	14·13	46·1	42·5
14·00	46·2	42·8	13·51	46·4	43·7
13·78	45·5	42·6	13·48	40·2	37·9
13·60	45·7	42·9	13·37	40·2	38·1
13·44	47·4	44·6	13·23	38·6	36·8
16·18	52·4	44·1	14·36	43·2	39·4
13·37	48·8	44·4	13·66	43·0	40·2
13·29	45·9	43·6	14·75	45·2	40·9
14·30	48·2	44·1	13·90	44·5	41·4
14·07	47·2	43·6	14·28	42·2	38·7
13·74	46·2	43·3	—	—	—
12·68	45·7	44·5	—	—	—
13·16	45·6	43·6	—	—	—
13·88	45·2	42·1	—	—	—
14·10	46·2	42·6	—	—	—
14·02	48·4	44·6	—	—	—
Average distance for 12-candle power . .		43·8	Average distance for 12-candle power . .		40·0

The numbers obtained at each temperature, it is true, vary somewhat from the mean; but a comparison of the numbers obtained at the two temperatures 86° Fahr. and 92° Fahr. will, I think, leave no doubt as to the fact that the radiometer is more sensitive at low than at high temperatures.

Assuming the radiometer which had been employed in all these experiments to be representative of its class, from the experiments it is, I think, clear, that this instrument cannot be trusted as a photometer, and that it is by no means likely to supersede the ordinary photometric methods. I do not, however, mean to say that the radiometer may not in some cases be useful as a confirmative test in photometry; but even this limited use can only be made of it by the expenditure of a considerable amount of time in the determination of the constants of the particular instrument used. This effect of the diminution of the sensibility of a radiometer at higher temperatures has apparently not been previously noticed; but it is quite what might be expected. So far as can be seen, the only effect of the alterations of temperature will be to cause alterations of the tension of the residual gas in the radiometer. That such alterations will have a considerable effect on the sensitiveness of the instrument, is clearly shown by Mr. Crookes's researches. In his "Experimental Contributions to the Theory of the Radiometer," Mr. Crookes writes:*—"Simultaneously with this decrease in the viscosity, the force of repulsion exerted on a black surface by a standard light varies. It increases (with air) very slowly till the exhaustion has risen to about 70 millionths of an atmosphere; at about 40 millionths the force is at its maximum, and it then sinks very rapidly till at 0·1 millionth of an atmosphere it is less than one-tenth of its maximum."

It appears clear, then, that in the radiometer used in the experiments the pressure was above 40 millionths of an atmosphere; that is, above the pressure at which radiation gives its maximum effect, for by the increase of pressure due to increase of temperature the sensitiveness of the instrument is impaired. Granting that Mr. Crookes's conclusions are correct, some radiometers, on the other hand, might become more sensitive at higher temperatures; that is, when the pressure is increased towards the point when the maximum effect from radiation could be obtained. This objection alone is, I think, almost fatal to the use of the radiometer *as a photometer*. From these experiments it would also appear that at certain pressures the radiometer is extremely sensitive to increase of pressure. Thus, taking the difference of temperature as being from 68° Fahr. to (say) 95° Fahr., there would be an increase in pressure in the radiometer of from 100 up to about 105 pressure, and this has caused a diminution in the distance at which the standard light is placed from about 55 to 40, or a decrease of distance equal to more than 25 per cent. Mr. Crookes's experiments have shown that at certain points a slight increase of pressure does rapidly decrease the sensibility of a radiometer to radiation, but the decrease of sensibility shown in the above experiments appears to be more rapid than Mr. Crookes's researches would indicate.

CHIPPING ONGAR GAS, COAL, AND COKE COMPANY, LIMITED.—This Company registered on the 7th inst., with a capital of £5000 in £10 shares, proposes to acquire the gas-works at Chipping Ongar, Essex.

* Proc. Roy. Soc., xxv., p. 305.

Correspondence.

[*We do not hold ourselves responsible for the opinions expressed by Correspondents.*]

THE TOTTENHAM COURT ROAD EXPLOSION.

SIR,—I notice in the last number of the JOURNAL a letter from Mr. A. Salanson, stating that no thoroughly satisfactory explanation has yet been offered of the intervals of time alleged to have elapsed between the successive explosions in the Tottenham Court Road. Mr. Salanson offers an explanation which is certainly feasible, but involves the supposition that the whole of the seven explosions were absolutely simultaneous. I do not think it is probable that this was so, and consider it far more likely that they were successive. I herewith beg to contribute a few words towards the better comprehension of the question.

In the first place, I firmly believe that the contents of the main at the time of the explosion were fairly homogeneous in composition. If any difference in composition existed, it was probably that at the point where the gas entered the main, the mixture contained the largest percentage of gas, and at the portion of the main most removed from that point, the mixture contained the largest percentage of air. Slight differences of composition in the way indicated *may* have existed, but I think it can be fairly assumed that at the time of the explosion the mixture of gas and air in the main was practically uniform throughout. Now every gaseous mixture which contains within itself the elements necessary for explosion or inflammation takes a definite time for ignition; that is to say, where the inflammable mixture is arranged as it were in a train (as along some 2000 feet of piping), a definite interval would be required for the ignition of the mixture from the one end to the other. The absolute velocity at which the ignition would proceed down the main would depend on the composition of the gaseous mixture. It would be most rapid where the proportions of gas and air were most favourable for explosion, and slowest when either ingredient in the mixture was largely in excess of the other.

Now what may be supposed to have happened at the accident is this. Starting with the application of the unfortunate light, the first effect of the ignition of the mixture of gas and air was a violent discharge from the near end of the pipe. As the explosion travelled on, the pressure in the main accumulating to such an extent that it could not be relieved speedily enough by discharge at the open end, the weakest spot in the main next the point of ignition gave way, and an audible explosion took place. As the ignition of the gaseous mixture proceeded along the main, the pressure again accumulated, and the next weakest point in succession gave way, and so on for the seven explosions.

This explanation appears to me to be reasonable, and in accordance with the facts of the accident, and also in accordance with our knowledge of the laws attending the ignition of inflammable gaseous mixtures.

Stepney, E., Aug. 27, 1880. H. LEICESTER GREVILLE.

CORRECTION.

SIR,—In the discussion on my paper upon Hislop's Lime Process, published in the last issue of the JOURNAL, I appear as having said that hydrogen and nitrogen combine to form water. What I meant to say was that the hydrogen probably combines with the nitrogen of the air, and goes off in the steam.

Aug. 26, 1880. A. F. WILSON.

Legal Intelligence.

LAMBETH POLICE COURT.—FRIDAY, JULY 23.

(*Before Mr.* ELLISON.)

ALLEGED CONSPIRACY TO DEFRAUD A GAS COMPANY.

Thomas Henry Carman, landlord of the Grapes public-house, Windmill Street, Haymarket; *William Thomas Carman*, son of the above, a billiard-table keeper, of Station Road, New Kent Road; *John Phillips*, manager at the same place; and *Joseph Horton*, gasfitter, of 12, Hanover Court, Long Acre, were summoned at the instance of the South Metropolitan Gas Company for unlawfully conspiring to defraud the Company of a quantity of gas.

Mr. WASHINGTON prosecuted on behalf of the Company; Mr. WARNER SLEIGH appeared for the two first-named defendants, and Mr. W. H. FULLAGAR defended Phillips. Horton did not answer to the summons against him, and a warrant was issued for his apprehension.

Mr. WASHINGTON having briefly stated the facts of the case, called the following witnesses:—

James Allen said: I am a labourer, living in Hanover Court, Long Acre, The defendant Horton lodged at the same place. He is, I believe, a gasfitter, by trade. Early in May last we went once or twice into the Grapes public-house, in Windmill Street, kept by Mr. Carman, sen. On one occasion Horton said to Mr. Carman: "I can save you a great deal of gas if you have a wet meter." Mr. Carman said: "No; it is a dry meter." Horton afterwards remarked to Mr. Carman that by piercing the drum of the meter the gas would escape to the body of the meter, and so pass into the service-pipes without being recorded by the index. This was said at the bar of the house, and only Horton, Mr. Carman, and I were present. Mr. Carman said: "Yes, I see. I have not got a wet meter, but I can recommend you to a place over the water where they consume a good deal of gas. It is in the New Kent Road. I will give you the direction." Horton and Mr. Carman went together into the private part of the house, and were away some five or six minutes. I stayed at the bar. When they came back Horton told me that he had asked Mr. Carman £5 for the job.

Mr. SLEIGH objected to this evidence being given. Horton was not, he said, present, and such evidence as this ought not to be received as against Mr. Carman.

Mr. ELLISON: I cannot agree with you. It is clearly the opening of an unlawful act.

Mr. FULLAGAR said he thought not.

Mr. ELLISON: You see the words used were "by piercing the drum," &c.

Mr. SLEIGH: Yes; but that was only according to the witness's statement. Horton and the witness were not only tempters but co-conspirators. If such evidence as this is allowed, Mr. Carman will not have the slightest chance of contradicting it.

Mr. ELLISON said it would, of course, require corroboration.

Examination continued: Horton told me he had asked Mr. Carman for a £5 note for the job, but he would only agree to give £3, which would be paid by instalments—10s. down, and the remainder at so much per month. A day or so afterwards we went to the New Kent Club, near the Elephant and Castle Railway Station. Horton and I went together, but we did not take any tools with us. We went into the club and there saw Mr. Carman, jun., and the defendant Phillips, the secretary of the club. This was from ten to half-past ten o'clock in the morning. I saw Horton speak to Mr. Carman, jun., but I did not hear what he said. I went with Horton as a sort of labourer, to assist in case I was wanted. After the conversation between Horton and Mr. Carman, jun., Horton gave me half-a-crown, and told me to go and get a drill made, and I did so.

Mr. SLEIGH: I must submit that this is not evidence.

Mr. ELLISON: I see a clear understanding between Horton and Carman, which I infer to be a conspiracy. There is something to show that Horton and his witness went over to the club in the New Kent Road, which had been mentioned by Carman, sen.

Mr. SLEIGH: Yes; I concede that, and that they went over there authorized by Carman, sen.; but there we reach a point we have no power to contradict. What I am going to show is that other people have gone over about the gas both before and after this. I have no wish to keep anything back. These two men were in conjunction and conspirators, and before such evidence is admissible I submit that it requires corroboration.

Mr. ELLISON: Yes; but that corroboration may come afterwards.

Mr. SLEIGH: I will admit that. If your worship is against me on this point, I bow to such an opinion.

Mr. FULLAGAR: There is not a tittle of evidence up to this time against Phillips.

Mr. WASHINGTON: If in the end that is so, I shall certainly withdraw the charge as against him.

Examination continued: I went to a shop in Newington Causeway. The drill now produced, as far as I can say, is the one that was made. Horton left half-a-crown deposit on it, and we went back to the billiard-room of the club. Horton then directed me to borrow a pair of steps to get up to the meter, which was on a platform at the end of the room. I procured a pair of steps. Phillips and Carman, jun., were still in the room, and were there during the whole time I fixed the steps. Horton went up to the meter, and I followed him. Neither Phillips nor Carman, jun., went up the ladder. Horton took off the tap.

Mr. SLEIGH: I must again interpose, your worship. (To witness:) Could Phillips or Carman, jun., see what was being done?

Witness: No. Horton unscrewed the overflow tap and introduced the drill into the hole. He gave it two or three bumps, and then found the drill too thick to act. Horton said, "I have never seen a meter like this before; it has got a guard in front of it." Horton found he could not perforate it, and he said: "Let them think it's done." We came down, and Horton went to Carman and spoke to him. I was not close to them, but I heard him say "We've done it."

Mr. SLEIGH: You said just now you were not close to them, and therefore how can you know what was said?

Witness: I heard something like it.

Mr. ELLISON: Repeat the words as near as you can.

Witness: Well, it was words to this effect—"We've done it." Carman, jun., then walked to a small bar, and I did not hear anything more said. We left in company with Carman, jun., and went to the shop where we had obtained the drill. Horton returned the drill, and I afterwards saw him with a piece of paper, which I am under the impression Phillips gave him.

Mr. SLEIGH: Stop, if you please. Let us have none of your "under the impressions."

Mr. FULLAGER: Did you see the paper given by Phillips?

Witness: Horton, Phillips, and Carman, jun., were together when it was given, but I cannot say positively who gave it. Horton afterwards gave the paper to Carman, sen., saying, "We have been over there." Carman, sen., gave Horton 5s., and Horton said, "That's not according to our agreement; you promised to give me 10s." Carman, sen., said, "You don't suppose I am going to give you 10s. when I don't know if it's done or not." We then left the house.

FRIDAY, JULY 30.

The witness *Allen* was recalled and, being further examined, said that a few days afterwards he went again with Horton to the club and saw Carman, jun. and Phillips there. Horton said to Phillips, "How is it getting on, Governor?" or something like that. Phillips replied that there was no difference in the consumption. Horton looked at the index of the meter and took its state on a bit of paper, which he showed to Phillips. There was a conversation, but he (witness) could not remember what it was. They afterwards went to a place in Westminster, and Horton asked a man there to make a drill. He told him the size, and the man said he could come the next day for it. On the following day the man, whose name was Underhill, gave Horton a drill. A few days after another drill was given to Horton. Nothing was said to Underhill as to what the drills were wanted for. Horton afterwards at home found the awl (produced) with a handle. He said this sort of awl would do, and would be just about the thing. They then went to the elder Carman's, and Horton showed him the two drills. There were people present in the bar at the time. Witness and Horton again went to the club, and Horton had the two drills, the awl, and a hammer. They saw Carman, jun. and Phillips there. Horton said to Carman, "We have come over to do the meter again," or words to that effect; but witness did not remember if any reply was made. Witness and Horton then went to the meter, and Horton placed the awl in the overflow plug, and gave it a tap with the hammer. Witness believed it pierced the drum and guard of the meter, but could not see. Gas came out with a whistling sound, and as if with pressure. Horton then said, "That's done it." Horton subsequently said to Carman, jun., "I've done it." Afterwards they went over to Carman, sen., when Horton wanted some money, but Mr. Carman told him he must wait for a day or two, and see how the meter went on. Witness was not sure whether or not any money was given to Horton by Carman; but thought not. A day or two afterwards witness again went over to the club with Horton, and Phillips produced a list of the readings of the meter. It was on a piece of paper, which he (witness) should know again if he saw it. Phillips said they had only burned 600 feet of gas for the past two nights, and Horton said, "That's better." Phillips said that it was much less than the other evenings. Phillips gave Horton a note to take to Carman, sen., and they went again to Carman's house the next day. Horton asked Mr. Carman for some money, and he gave him some out of the till, but witness did not know how much. They went several times about money, and then a dispute arose, Horton saying Mr. Carman had not acted up to his contract. Mr. Carman said he did not believe a bit of good had been done, and Horton said that if he intended to "do" him, he (Horton) would "do for" him. Mr. Carman seemed offended, and walked away. Witness from first to last had not received any money. Horton kept the money and spent it. All the witness had was some beer. On one occasion Phillips said there had been an extensive leakage; but this was after the puncture of the meter-drum had been made; before that witness had heard nothing about leakage.

In cross-examination, witness said he had been in service of the prosecutors since he turned round on Horton. He had had 18 months imprisonment for passing counterfeit coin, but was hard at work before that. When Horton obtained the awl, witness knew he meant to defraud the Company. He knew that Phillips told Horton that a gas plumber had been to see the meter, and that he had mentioned to the plumber what had been done, and he said he had done a very foolish thing. Would swear that he did not say Briggs had found out that the meter had been tampered with.

FRIDAY, AUG. 6.

John Robbins, a blacksmith, working in York Street, London Road, said he knew Allen and Horton, and the first time he saw them they came and asked the foreman to make them a drill. Horton spoke, but he did not say what it was for. He saw a file on the bench, and said that would do if it was drawn down to the sixteenth of an inch. The file produced was not, in his opinion, the one which was given to Horton. Horton brought the file back and said it was no use for what he wanted it for, and the deposit of 2s. 6d. was returned to him.

Some evidence was then given by *John Saltmarsh*, of 16, Station Road, as to lending the pair of steps to Allen to enable him to get up to the meter, and by *Samuel John Underhill*, of 101, Vauxhall Bridge Road, an engineer, who said he knew Horton very well. He borrowed two small punches of witness, as he said he had a little gas-fitting job to do. The two punches produced were the same. *Charles Wilson*, landlord of the premises in Station Road, also gave evidence as to Carman, sen., being his tenant.

Mr. *Charles Howard*, Chief Inspector of the Company, said Allen, after seeing the Secretary, made a communication to him, and witness gave instructions for the meter to be fetched away and another put in its place. He examined the meter afterwards at the testing office, Southwark Street, and was informed it registered correctly. After further examination the waste box was taken off, and then two perforations were found in the guard, such as would be made by either of the three instruments produced. The inner case had not been perforated. If it had been it would have passed gas, to the extent of the hole, without registering. With such holes gas could have been taken through the waste plug by a tube, but he could not tell if gas had been abstracted or not. Permission was never given to any one to tamper with the Company's meters, and there would be no necessity for punches like those produced, or other instruments, being used, and there was no defect that could be remedied by such an operation. If there was any flickering in the lights there would be no necessity to do anything through the water-plug.

George Fredk. Beverton, gas-meter maker, gave evidence, saying he was in the employ of the Company, and took the state of the index of the meter in question when it was removed.

Some evidence was then given as to the connection of the meter with the pipes; after which

Mr. *George Detheridge*, Inspector of Meters for the district, gave evidence as to the wheel in the meter in question being sound. He tested the meter and found it registered correctly. There was nothing that could be remedied by punching a hole through the waste plug. If such a hole was punched, the plug could be used to abstract gas unregistered.

Edmund Reid, a detective of the P division, who had charge of the case, said he received the instruments produced from the witness Allen, and a file from another witness.

FRIDAY, AUG. 20.

Mr. *George Hewes*, a clerk in the employ of the Company, said he kept the register of complaints. He produced the same, being in his handwriting. There was no complaint whatever in respect to the new meter or gas-fittings at the New Kent Club, Station Road, from the commencement of May down to the 15th of July. On the 15th of July he received the following letter, signed by T. Carman: "In consequence of water being generated in fresh gas-fittings, I am directed to have a dry meter fixed on Saturday. Please send and take index of the wet meter now in use."

Mr. WASHINGTON (to Magistrate): You will remember, Sir, this was after the second meter had been fixed and the first meter taken away. The substituted meter was taken on the 19th of July, and two days after the old meter had been taken away by the Company this complaint was made. This is the case for the prosecution, and upon the evidence given I ask you to commit the defendants for trial on a charge of conspiracy to defraud the Company.

Mr. FULLAGAR said he was only appearing on the part of Phillips, and on his behalf he asked whether his worship thought there was a tittle of evidence against him upon which he could possibly be committed to take his trial.

Mr. ELLISON said the case of Phillips was that he was simply present, but really knew nothing about it, and was only a servant.

Mr. WASHINGTON said the Magistrate had forgotten, in the voluminous evidence which had been taken, that he showed the register to Allen.

Mr. FULLAGAR: That register I hold in my hand as one of the most conclusive proofs that Phillips has been in no way mixed up in this attempted fraud, if it is an attempted fraud. Here is the register kept in his own handwriting. I wish some evidence to be brought on the part of the prosecution, to say whether they can contradict the items of the state of the meter as put down daily by Phillips; and if not, it would clearly show that after this tampering by these two men had taken place at the meter, the index actually proved more against the consumer than it did before.

Mr. WASHINGTON: My friend very wisely has not put in that register; nor have I a copy of it.

Mr. FULLAGAR: You have had an opportunity of seeing it; and I put it in as one of the strongest pieces of evidence of the innocence of Phillips. It was kept by him to prove the daily expense which they were put to.

Mr. ELLISON: The case must go on. You will have plenty of opportunity to make your defence at the proper time.

Mr. FULLAGAR: I should like to ask, is there any one who has taken an account of the meter, because I want to be able to prove that these daily takings by Phillips are correct? I should like to ask Mr. Howard if he can give me some information about it. I do not know if he can.

Mr. *Howard*, recalled, said, in reply to Mr. Fullagar, that the agreement with the Company was signed on the 18th of May last, and the meter would be put up, he supposed, on the following day. The meter would be examined at the half quarter and quarter, making once in every six weeks. The amount of gas consumed had been given in evidence by the person who took it down.

Mr. FULLAGAR: I want to know, Mr. Howard, is there any witness, a practical man, who, looking at this statement as representing the daily consumption of gas through this meter, can say whether in his opinion it is correct or not?

Witness: It would be almost impossible for any man to say so, unless it is the person who took it down daily. In a billiard room the consump-

tion depends upon the quantity of play going on. It is an unpractical question, which no one could answer unless he had been present and witnessed the play.

Mr. ELLISON: The gas may be burning at a table for an hour or two hours, or the whole evening through.

James Allen, recalled and further cross-examined by Mr. FULLAGAR, said that Phillips in no way interfered with Horton and himself. Phillips was having his breakfast at the time. Phillips did not complain to him of the flickering and bad light which the gas gave, but he might have done so to Horton. Some papers were handed to the witness, which he said he could not swear to as being the paper Phillips showed him. One of them was very similar [the daily register of the meter], but a great deal more had been added to it. It was possibly the latter end of May when he was shown the paper.

Mr. FULLAGAR: The latter end of May would only extend down part of the page. It has been continued during June and July. That would account for the difference. (To witness:) Taking this paper down to there (pointing), does it represent what was shown to you?

Witness: Yes, or a little lower down.

Mr. FULLAGAR: Then I shall put the paper in.

The defendants were then cautioned and asked if they had anything to say in answer to the charge.

Carman, sen., said he was perfectly innocent, and had no idea of attempting to defraud the Company.

Phillips had nothing to say except that he was only a servant, and that he had been continually complaining of the gas being bad.

Horton said: These three men know nothing about this affair whatever. I merely went to look at the meter. There was a shifting of the light. There was a bit of metal on the water socket which prevented the water coming out of the socket, and I tried to remove it. The next I heard of the affair was there was a summons out against me for damaging the meter. I plead guilty to damaging the meter through ignorance on my part. I think it is very unjust and unfair that these three men should be brought into this affair, of which they know nothing.

Carman, jun., declined to say anything.

In answer to Mr. Ellison, the defendants said they would not call any witnesses, and were then committed for trial to the next Surrey Sessions to be held on the 6th of September, their own recognizances being taken for the appearance of the Carmans and Phillips, while two sureties of £15, or one of £30, with notice to the police, were required as regards Horton.

Miscellaneous News.

SCARBOROUGH GAS COMPANY.

The Annual Meeting of this Company was held on Saturday, the 21st inst.—Mr. W. ROUNTREE in the chair—when the Directors presented their report, which stated that notwithstanding that the price of gas was reduced from the commencement of the present year, and the great economy practised by all classes of consumers, the Company's receipts showed an increase over the preceding year, whilst the cost of manufacture had been materially reduced. The sums expended in the extension of mains, service-pipes, lamps, and some minor extensions at works (£533 16s. 5d.), and the further sum expended in replacing the foul main and an exhauster, and in providing two meters of large capacity for the Spa (£736 16s.), had been placed to the suspense account, which, with the balance to the debit of the account, made a total of £2470 7s. 8d. This sum they had transferred from the revenue account, and thereby liquidated the suspense account altogether. The balance of revenue account after this transfer, and after deducting the half year's dividend paid in March last, and meeting every liability of the Company, amounted to £3714 4s. 6½d., which enabled the Directors to recommend the payment of a full dividend to each class of Proprietors, leaving a balance of £96 4s. 7½d. to carry forward to the contingent-fund, which will then amount to £3994 5s. 11½d. The Directors also recommended that £15,000 of new ordinary stock should be created to meet the cost of the Company's new gasholder, and any future outlay that may be required. The total outlay on capital account to June 30 was £150,031, which included the expenditure of £8361 during the past twelve months. The receipts from gas and meter rentals, public lamps, &c., during last year were £24,962; and from residuals, £5121.

On the motion of the CHAIRMAN, seconded by Mr. BECKITT, the report was adopted.

The CHAIRMAN then moved that a dividend of 10 per cent. on the original stock, 7½ per cent. on the new consolidated stock, and 7 per cent. on the new ordinary stock of the Company, for the half year ending June 30, be paid.

Alderman FOWLER seconded the motion, which was carried.

The three retiring Directors (Messrs. P. Hick, F. Ness, and T. Hick) and the retiring Auditor (Mr. Hawson Herbert) were re-elected; Alderman Fowler was elected a Director in the place of Mr. A. Clapham; and £200 was placed at the disposal of the Directors as a remuneration for their services during the current year.

An extraordinary meeting of Shareholders was then held, when resolutions were carried with reference to raising additional capital, recommended in the report.

A cordial vote of thanks to the Chairman and Directors concluded the proceedings.

METROPOLIS WATER SUPPLY.

The following is Dr. Frankland's report of his analyses of the water supplied to London during July:—"Taking the average amount of organic impurity contained in a given volume of the Kent Company's water during the nine years ending December, 1876, as unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Water Companies, and by the Tottenham Local Board of Health, was—Colne Valley, 1·1; Kent, 1·6; Tottenham, 1·7; New River, 2·1; Chelsea, 3·1; West Middlesex, 3·5; East London, 3·7; Lambeth, 4·1; Grand Junction, 4·4; Southwark, 5·2. The Thames water delivered by the Chelsea, West Middlesex, Southwark, Grand Junction, and Lambeth Companies was inferior in quality to that delivered in June, and it was slightly turbid when drawn from the mains of the West Middlesex and Lambeth Companies. The water of the Lambeth Company contained moving organisms. The water drawn from the Lea by the East London Company was no better than Thames water, but that abstracted by the New River Company, partly from the same source and partly from springs, would have been nearly equal to deep-well water, if it had been efficiently filtered. It was, however, slightly turbid, and contained moving organisms. The deep-well water supplied by the Kent and Colne Valley Companies and by the Tottenham Local Board of Health was of its usual excellent quality for dietetic purposes, and that delivered by the Colne Valley Company was suitable for all domestic purposes, having been softened before delivery. Seen through a stratum two feet deep, the waters presented the following appearances:—Kent, Colne Valley, and Tottenham, clear and colourless; New River, slightly turbid, and nearly colourless; Chelsea and East London, clear and very pale yellow; West Middlesex and Lambeth, slightly turbid and very pale yellow; Southwark and Grand Junction clear and pale yellow.

Results of Analyses expressed in Parts per 100,000.

Companies or Local Authorities.	Total Solid Matters.	Organic Carbon.	Organic Nitrogen.	Ammonia.	Nitrogen, as Nitrates and Nitrites.	Total combined Nitrogen.	Chlorine.	Total Hardness.
Inner Circle.								
Thames—								
Chelsea	24·00	·145	·040	0	·144	·184	1·6	19·7
West Middlesex	22·86	·177	·028	·002	·144	·174	1·5	18·2
Southwark	25·32	·265	·044	·001	·123	·168	1·5	20·0
Grand Junction	25·32	·210	·047	0	·115	·162	1·6	20·0
Lambeth	22·90	·204	·037	0	·066	·103	1·6	17·1
Lea—								
New River	26·46	·098	·023	0	·184	·207	1·6	26·9
East London	27·92	·191	·029	·005	·102	·134	1·8	20·9
Deep wells—Kent	42·30	·078	·017	0	·404	·421	2·5	27·8
Outer Circle.								
Colne Valley	12·72	·051	·014	·005	·363	·381	1·4	6·9
Tottenham Local Board	39·84	·086	·013	·058	0	·060	2·9	20·5
Corporation of Birmingham*	28·36	·175	·020	·004	·253	·276	1·7	16·7
Corporation of Glasgow†	2·38	·136	·016	0	·006	·022	·6	·9

* Analyzed by Dr. Alfred Hill, Medical Officer of Health and Analyst to the Borough.
† Analyzed by Dr. E. J. Mills, F.R.S., of Anderson's College, Glasgow.

Note.—The numbers in the analytical table can be converted into grains per imperial gallon by multiplying them by seven, and then moving the decimal point one place to the left. The same operation transforms the hardness in the table into degrees of hardness on Clark's scale.

The Registrar-General publishes the following table in reference to the water supply of London during July. According to the returns furnished to him by the Metropolitan Water Companies, 150,398,010 gallons, or 683,327 cubic mètres of water (equal to about as many *tuns* by measure, *tons* by weight), were supplied daily, or 255 gallons (115·9 decalitres), rather more than a *ton* by weight, to each house, and 35·9 gallons (16·3 decalitres) to each person, against 33·7 gallons during July, 1879.

Companies.	Number of Houses, &c., supplied in July, 1879.	July, 1880.	Aver. Daily Supply of Water in Gallons* during July, 1879.	July, 1880.
Total supply	566,943	589,560	135,618,047	150,398,010
From Thames	270,176	283,006	70,175,631	75,796,585
„ Lea and other Sources	296,767	306,554	65,442,416	74,601,425
THAMES.				
Chelsea	29,700	30,071	9,139,200	9,652,900
West Middlesex	52,532	55,154	11,040,207	11,948,052
Southwark and Vauxhall	86,570	90,765	23,968,176	24,323,529
Grand Junction	39,648	42,314	12,256,148	13,559,604
Lambeth	61,726	64,702	13,771,900	16,312,500
LEA AND OTHER SOURCES.				
New River	128,492	131,103	27,951,000	30,603,000
East London	120,459	125,478	29,108,900	35,066,000
Kent	47,816	49,973	8,382,516	8,932,425

* Including that for manufactures and for various purposes other than for domestic consumption.

Note.—The return for July, 1880, as compared with that for the corresponding month of 1879, shows an increase of 22,617 houses, and of 14,779,963 gallons of water supplied daily.

A PROPOSAL TO SUPPLY WATER FOR LONDON FROM BALA LAKE.

The following is a proposal to supply London with water from Bala Lake, North Wales, which, it is stated, was submitted to Sir William Harcourt by Mr. J. W. Welborne for consideration by the Select Committee of the House of Commons, whose report we have already published (see *ante*, p. 219):—

The water of Bala Lake has been carefully tested and proved to be equal in purity to the water of Loch Katrine, and ample in quantity for the supply of the Metropolis. It is also probably sufficient for the towns *en route*. The country adjacent is sparsely populated, and a few mountain sheep and grouse constitute the occupants of the surrounding hills; hence there is a minimum of possible pollution. The rainfall registered at Bala for the year 1876 was 52·69 inches, which is about the average rainfall there. The lake is nearly 4 miles long by ¾-mile wide, covering 1100 acres. The watershed of the district contains 35,392 acres, or 55 square miles. This with the Bala register of rainfall would, after deducting 10 per cent. for absorption, give 37,040 million gallons per year, or 104 millions per day. But inasmuch as Bala lies on a level with the lake, the register of the rainfall there does not represent the rainfall of the district. On the surrounding mountains the rainfall is probably twice as much as in the valley, which will leave a large surplus for supply, after giving compensation to the river.

The lake is 553 feet above Trinity high-water mark, and 300 feet above Stanmore, where it is proposed to make the reservoirs. By embanking the lake 5 feet, and drawing down 2 feet below the present level, sufficient water can be impounded to supply 104 million gallons daily, for 37 days without any rainfall. Should a further supply be required, 50 million gallons per day can be obtained from the River Vyrnwy, which is situated on the lines of route to the Metropolis.

It is proposed to convey the water from Bala through a series of iron pipes, sunk to a depth sufficient to protect them from the action of the frost, along the sidings of the Great Western Railway to Stanmore, where the reservoirs should be on a scale adapted to provide for a storeage of water equal to 40 days supply. These should consist of one or more large reservoirs and ten smaller ones. The large reservoir would be capable of holding 3000 million gallons or 30 days supply, and would be lined with brick or stone. The ten smaller ones, lined with white glazed brick, would each be calculated to contain 100 million gallons. The space required for these reservoirs would be 500 to 600 acres for the large ones, according to depth, and 25 acres for each of the smaller ones. The water would be delivered into the large reservoirs as pure as at its source, thence it would pass through a system of filtration of approved character into the smaller reservoirs in a condition of absolute purity. These reservoirs being 250 feet above the Bank of England, the water on reaching London would be conveyed through the existing mains of the Water Companies at high-service level.

Had Bala Lake existed at Stanmore instead of in North Wales, it would doubtless long ago have formed the source of the London Water Supply. If it is approved as a source of supply, it is simply an engineering question how to convey the water for the use of the Metropolis free from pollution in the most effectual and economical way.

By adopting the sidings of the Great Western Railway as the route, the following advantages would be obtained:—1. The right of way for almost the entire route would be secured by one negotiation. 2. Land otherwise of no value would be utilized without detriment either to it or to the property of the Railway Company. 3. All the plant required would be delivered by the Railway Company at the places where it would be laid. 4. The telegraph system would be available in case of any accident to the pipes. 5. There would be great saving in the time required for the construction, and also great saving in the cost.

By making the reservoirs at Stanmore, a sufficient level would be obtained to supply the high service to London without pumping, the cost of which, at present, with filtration, is about £100,000 per annum. By the use of white glazed bricks for the lining of the smaller reservoirs, facilities for quickly and thoroughly cleansing them would be obtained. In short, pure water would be delivered from them as from a china basin.

SOUTH METROPOLITAN GAS COMPANY.

The Half-Yearly General Meeting of this Company was held last Wednesday at the Bridge House Hotel, London Bridge—Captain THOMAS B. HEATHORN, R.A., in the chair.

The SECRETARY and ENGINEER (Mr. George Livesey) read the notice convening the meeting and the minutes of the last general meeting.

The CHAIRMAN then affixed the seal of the Company to the register of Shareholders, stating that it had been examined very carefully.

The following report of the Directors and accounts of the past half year's working were taken as read:—

At the meeting in April last, the announcement was made that the amalgamation of the Phœnix Company had been confirmed. The United Company now consists of three out of the four Metropolitan Companies which supplied gas south of the Thames.

This being the first half year of the Amalgamated Company, it is not possible to make a comparison with the working of the corresponding half of last year. The Directors are, therefore, unable to give a detailed statement of the results of the amalgamations; suffice it to say, they are so confident those results will be favourable, that they have reduced the price of gas in the district of the late Phœnix Company, from 3s. 4d. to 3s. per 1000 feet from Midsummer last, thus making the price uniform throughout the whole district of the Company.

By the scheme of amalgamation, they were empowered to maintain a differential price until the end of the year, but it was considered that the interests of both consumers and proprietors would be served by a reduction at the earliest possible moment.

The new gasholder is progressing satisfactorily, and the various stations of the Company are in a good state of efficiency. Provision is being made at the works of the late Phœnix Company to comply with the requirements of the recent legislation as to purity, &c.

The accounts now presented show a profit sufficient to warrant the recommendation of the following full dividends, viz.:—11¾ per cent. on the "A" stock; 11 per cent. on the "B" stock (late Surrey capital), and 10½ per cent. on the "B" stock (late Phœnix capital). The dividends will be paid on the 8th of September next.

As a consequence of the price of gas being made uniform, the two divisions of class "B" are now completely merged, and rank equally for dividend and in all other respects after payment of the present dividend.

No. 1.—STATEMENT OF CAPITAL (STOCK) *on June* 30, 1880.

Acts of Parliament authorizing the Raising of Capital.		Standard Dividend; the Standard Price being 3s. 6d.	Paid up.	Amount not paid up.	Total Amount Authorized.
South Metropolitan Acts, 1842 and 1860	A	10 per cent.	£500,000 0 0	..	£500,000 0 0
Surrey Consumers Acts, 1854 and 1863	B	Do.	249,970 0 0	£30 0 0	250,000 0 0
Phœnix Acts, 1824 and 1864	B	Do.	1,081,982 0 0	18 0 0	1,082,000 0 0
South Metropolitan Act, 1876	B	Do.	..	18,000 0 0	18,000 0 0
Do. Do. 1876	C	Do.	..	232,000 0 0	232,000 0 0
			£1,831,952 0 0	£250,048 0 0	£2,082,000 0 0

No. 2.—STATEMENT OF LOAN CAPITAL *on June* 30, 1880.

Acts of Parliament authorizing Loan Capital.	Description of Loan.	Rate per Cent. of Interest.	Total Amount Borrowed.	Remaining to be Borrowed.	Total Amount Authorized.
South Metropolitan Act, 1869	Debenture Stock.	Not exceeding 5 per cent.	£58,868 10 0	£3,631 10 0	£62,500 0 0
Do. do. 1876	..	Do. 5 do.	Nil.	187,500 0 0	187,500 0 0
Surrey Consumers Acts, 1854 & 1863	Bonds.	Do. 5 do.	59,500 0 0	500 0 0	60,000 0 0
			£118,368 10 0	£191,631 10 0	£310,000 0 0

No. 3.—CAPITAL ACCOUNT.

Dr.

To Expenditure to Dec. 31, 1879	..	£1,970,378 4 10
Expenditure during half year to June 30, 1880, viz.—		
New buildings and machinery in extension of works	£30,234 19 2	
New and additional mains and services	5,149 8 11	
New and additional meters	2,124 16 8	
		37,509 4 9
Total expenditure	..	£2,007,887 9 7
Less by conversion under scheme	..	161,994 0 0
		£1,845,893 9 7
Balance	..	104,427 0 5
		£1,950,320 10 6

Cr.

Description of Capital.	Certified to Dec. 31, 1879.	Received since that Date.	Total to June 30, 1880.
By A stock	£500,000 0 0	..	£500,000 0 0
B stock	249,970 0 0	..	249,970 0 0
Debenture stock	16,718 0 0	£42,150 10 0	58,868 10 0
Bonds	60,000 0 0	..	59,500 0 0
*Shares of £20 each	540,000 0 0	..	540,000 0 0
*Capitalized stock	144,000 0 0	..	144,000 0 0
*New stock	324,000 0 0	35,976 0 0	359,976 0 0
*New Shares of £20 each	200,000 0 0	..	200,000 0 0
		£78,126 10 0	..
Less paid off	..	500 0 0	..
	£2,034,688 0 0	£77,626 10 0	£2,112,314 10 0
Less by conversion under scheme			161,994 0 0
			£1,950,320 10 0

* These Shares and Stocks are now converted into equivalent amounts of Ordinary "B" Stock.

No. 4.—REVENUE ACCOUNT.

To Manufacture of gas—			
Coals, including dues, carriage, unloading, and trimming. (See Account No. 9)	£126,144 10 0		
Purification, including £1441 9s. 5d. for labour.	4,730 15 3		
Salaries of Engineer, Superintendent, and Officers at works	5,717 8 0		
Wages (carbonizing)	27,678 7 2		
Repairs and maintenance of works and plant, materials, and labour, less £237 10s. 11d. received for old materials	27,469 10 10		
		£191,740 11 3	
Distribution of gas—			
Repair, maintenance, and renewal of mains and service-pipes, including labour	£7,878 4 9		
Salaries and wages of Officers (including Rental Clerks)	8,311 16 5		
Repairing and renewals of meters	4,341 7 5		
		20,531 8 7	
Public lamps—Lighting and repairing		5,525 11 7	
Rents, rates, and taxes—			
Rents payable	£882 1 5		
Rates and taxes	7,202 19 10		
		8,085 1 3	
Management—			
Directors allowance	£2,330 10 7		
Do. compensations	17,244 7 1		
Salaries of Secretary and Clerks	4,425 14 6		
Collectors commission	5,553 11 0		
Stationery and printing	1,407 5 5		
General charges	969 13 10		
Company's Auditors	112 10 0		
Auditors compensation	605 0 0		
		32,648 12 5	
Law and parliamentary charges		2,036 10 1	
Bad debts		1,187 7 11	
Superannuation-fund		992 6 8	
Gas Referees and Official Auditor		178 11 11	
Total expenditure		£262,926 1 8	
Balance carried to net revenue account, No. 5		104,511 14 0	
		£367,437 15 8	

By Sale of gas—			
Common gas (per meter)—			
at 3s. 4d. per 1000 cubic feet	£133,503 7 3		
at 3s. per 1000 cubic feet	120,075 0 5		
	£253,578 7 8		
Public lighting and under contracts (see Statement No. 11)	25,989 11 11		
		£279,567 19 7	
Rental of meters		5,695 9 7	
Residual products—			
Coke, less £2374 9s. 2d. for labour and cartage	£43,056 9 1		
Breeze, less £735 8s. 6d. for labour and cartage	664 4 8		
Tar	17,818 13 5		
Ammoniacal liquor	19,166 14 7		
		80,706 1 9	
Rents receivable		1,454 7 3	
Transfer fees		13 17 6	
Total receipts		£367,437 15 8	

No. 5.—PROFIT AND LOSS (NET REVENUE) ACCOUNT.

Interest on temporary loan and deposits		£115 11 3	Balance from last account		£142,158 15 4
Amount for debenture interest		1,204 10 1	Less dividend on ordinary capital for the half year ending Dec. 31, 1879		93,415 0 4
Amount for bonds		1,453 9 9			£48,743 15 0
Reserve-fund		724 0 7	Amount from revenue account, No. 4		104,511 14 0
Compensation under amalgamation scheme		45,821 9 5	Interest on moneys on deposit		368 19 10
Balance applicable to dividend on ordinary share capital		104,005 7 9			
		£153,624 8 10			£153,624 8 10

No. 6.—RESERVE-FUND.

Balance on June 30, 1880	£180,740 12 5	Balance on Dec. 31, 1879	£176,762 19 7
		Interest on amount invested	724 0 7
		Do. do	3,253 12 3
	£180,740 12 5		£180,740 12 5

No. 7.—RENEWAL-FUND (LEASEHOLD.)

Balance on June 30, 1880	£3,569 5 6	Balance on Dec. 31, 1879	£10,900 0 4
Renewal of lease (Surrey Commercial Dock Co.)	7,500 0 0	Interest on amount invested	169 5 2
	£11,069 5 6		£11,069 5 6

No. 8.—INSURANCE-FUND.

Balance on June 30, 1880	£20,865 1 7	Balance on Dec. 31, 1879	£20,739 17 1
		Interest on amount invested	125 4 6
	£20,865 1 7		£20,865 1 7

No. 9.—STATEMENT OF COALS.

Description of Coal.	In Store, Dec. 31, 1879.	Received during the Half Year.	Carbonized during the Half Year.	Used during the Half Year.	In Store, June 30, 1880.
	Tons.	Tons.	Tons.	Tons.	Tons.
Newcastle coal	31,382	175,056	182,173	163	24,082
Cannel coal	2,339	6,780	7,041	..	2,078
	33,721	181,816	189,214	163	26,160

No. 10.—STATEMENT OF RESIDUAL PRODUCTS.

—	In Store, Dec. 31, 1879.	Made during Half Year (estimated).	Used in the Half Year (estimated).	Sold in the Half Year.	In Store, June 30, 1880.
Coke . *Chaldrons of 36 bushels.	11,804	249,156	64,276	189,033	7,651
Breeze do. 36 do.	1,894	16,506	1,350	15,708	1,342
Tar . Gallons	134,315	1,913,781	3,900	1,938,784	105,412
Ammoniacal liquor—Butts of 108 gallons, 8-oz. strength	6,698	49,901	..	53,395	3,294

* Under Weights and Measures Act, 1878.

No. 11.—STATEMENT OF GAS MADE, SOLD, &c.

Description of Gas.	Quantity made, partly measured in Gasholders.	Quantity Sold.			Quantity used on Works, &c., (partly estimated.)	Total Quantity accounted for.	Quantity not accounted for.	Number of Public Lamps.
		Public Lights (estimated).	Private Lights (per Meter).	Total Quantity sold.				
	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	Thousands.	
Common	1,857,562	137,183	1,610,846	1,747,029	17,000	1,765,029	92,533	13,065

No. 12.—BALANCE-SHEET.

To Capital—			
For balance, per account No. 3			£104,427 0 5
Reserve-fund—			
For balance, per account No. 6			180,740 12 5
Renewal-fund—			
For balance, per account No. 7			3,569 5 6
Insurance-fund—			
For balance, per account No. 8			20,865 1 7
Net revenue account—			
For balance, per account No. 5			104,005 7 9
Debenture and bond interest for amount due to June 30, 1880			2,657 19 10
Sundry tradesmen, for amount due for coals, stores, and sundries			21,379 0 2
Deposits by consumers			15,697 16 1
Property-tax account			117 2 8
Dividend account (outstanding)			304 9 11
Balance of debenture stock account			0 16 7
			£453,764 12 11
By Cash at Bankers			£90,930 19 3
Amount invested—			
Reserve-fund	£180,740 12 5		
Renewal-fund	3,569 5 6		
Insurance-fund	20,865 1 7		
		205,174 19 6	
Cash in hand for freight, accounts, &c.			3,245 2 6
Stores in hand—			
Coals	£19,455 1 8		
Coke and breeze	2,452 12 0		
Tar and ammoniacal liquor	2,298 14 0		
Sundry stores	5,253 10 0		
		29,459 17 8	
Accounts due to the Company—			
Gas and meter rental, quarter ending June 30, 1880	£102,535 3 3		
Arrears outstanding	4,276 5 3		
		106,811 8 6	
For coke and other residual products			16,984 4 1
Sundries			1,158 1 5
			£453,764 12 11

The CHAIRMAN said: Ladies and Gentlemen,—The Proprietors of the three amalgamated Companies—the South Metropolitan, Phœnix, and Surrey Consumers—have practically met before; but from a business point of view this is really our first meeting, because the half year ending on the 30th of June last, was the first term that showed results of management grounded on the complete fusion of all interests. Your Board was unanimous in its desire to find out all that was good in the working of each Company. We did so; and utilized it for the beneficial working of the present concern. The report tells you that it is impossible to make a comparison with the corresponding half of last year. All, therefore, that can be given you is a simple statement of the aggregate gas rental which is as nearly as possible identical for the two half years. This is owing to a reduction of 9d. per 1000 feet in the price of gas in the late Surrey Consumers Company's district which takes off just £10,000 from the half year's receipts. This £10,000 represents the actual increase of business, equal to about 3½ per cent., which is not unsatisfactory, following as it does on an abnormally large increase the previous year. The paragraph in the report, which is regarded with most satisfaction by the Directors, is the announcement that, from Midsummer last, the price of gas in the late Phœnix Company's district has been reduced from 3s. 4d. to 3s. per 1000 feet, giving uniformity of price, under the scheme of amalgamation, six months earlier than was expected. It is very satisfactory that we should have been able to bring about this result, because it simplifies the position of the "B" capital. One effect of this reduction proves the groundlessness of the fears entertained by some of those who opposed amalgamation on the ground that uniformity could only be produced by raising our 3s. standard price. This fear was through ignorance of the principle of the sliding scale, which makes it the interest of the Company to reduce the cost of gas, and imposes the penalty of reduction of dividend for advance of price. Another result of the reduction in the charge is to place all the "B" stock on one level for the future. Up to June 30 last the late Surrey Consumers Company's capital was entitled under the amalgamation scheme of last year to 11 per cent.—which they will receive—while the Phœnix Company's capital, owing to the price of gas in their late district being then 3s. 4d. per 1000 feet will only receive 10½ per cent. Now by the reduction of 4d. in this last-mentioned district all the "B" capital, both Surrey and Phœnix, will in future be entitled to a dividend of 11¼ per cent. if it is earned—and I hope, and have every reason to hope, that the next dividend after the one about to be declared to-day will be still better. The reductions in price that have followed amalgamation diminish the revenue of the Company to the extent of £48,000 per annum. The public are therefore benefited to that extent. Simplicity, too, in the connection of the mains in the various districts enables the Company to efficiently supply gas at a lower pressure, and guards against failure of supply from any local accident. If in any part of the district there should be a deficiency of supply, the works in another part are now connected, and the difficulty is got over. Next year a full account will probably be given of the large gasholder now in course of erection at the Old Kent Road works. The capacity of it is greatly in excess of any other holder in existence. That erected by the late Phœnix Company at Kennington is the largest at present. I am glad to say this new holder is getting on most favourably, and we hope it will be finished well within the time allowed the contractors. Its cost will be—tank and all complete—£47,000, or something under £9 per 1000 feet of capacity, the usual cost for smaller holders being about £18 or £20 for the same measurement. I conclude by moving—"That the report and accounts be accepted, and the report entered on the minutes;" and when this motion has been seconded your Directors will be ready to hear and answer any questions you may do us the pleasure of putting to us.

Mr. SIMPSON ROSTRON said it gave him much gratification to second the motion. He was sure that any one who considered the exceptional character of the past half year's working of the Company must be very well satisfied with the inspection of the report, which filled the Directors with every confidence for the future.

The CHAIRMAN put the motion, and it was at once carried unanimously without discussion.

The DEPUTY-CHAIRMAN (Mr. James Shand) then said: Ladies and Gentlemen, You have gone through half the business of the meeting, which was to pass the report and accounts. The next part is still pleasanter, for it refers to the dividend to be declared; and in the report which has been sent to you you have seen, as the Chairman stated, that we are enabled, if you see fit, to pay an increased dividend, with regard, at all events, to the "B" Shareholders. Of course, you expected when the last amalgamation took place, that some benefit would result not only to the public, but also to the proprietors. The result to the public has arisen, as the Chairman has told you, in fixing the price of gas from Midsummer last at 3s. per 1000 feet; and, bear in mind, that very recently the price in one district was 3s. 9d., and in the other 3s. 4d. The public, therefore, cannot complain of the results of the amalgamation; and the sliding scale now comes in to our benefit, and shows the great advantage of such an arrangement, which was introduced to a large extent by your Secretary and Engineer. I may state that the "A" Shareholders, who represent the old South Metropolitan Company, could not be expected to come into the arrangement without some advantage to themselves. The Company had been charging 3s. per 1000 feet for some time, and beyond 11 per cent. the "A" Shareholders receive a certain proportion more of the extra money than "B" Shareholders. Of course, there are various reasons why we look forward to being able to do this. One is in the economies effected. In consequence of the amalgamation the Board are reduced in number and less is paid for fees. Furthermore, two Secretaries have retired, and also two principal Engineers. There are other savings in other directions. For instance, the Chairman mentioned about the pressure. We are en-

abled to connect all our mains together, and the consequence is that we can send out the gas at a lower pressure than before, and this reduces the amount of leakage. There are other changes which will be made gradually, but which cannot be introduced all at once. I move—"That a dividend at the rate of 11¼ per cent. per annum on the 'A' stock and 11 per cent. per annum on the 'B' stock (late Surrey capital) and 10½ per cent. per annum on the 'B' stock (late Phœnix capital) for the last half year be now declared, and that the warrants be sent to the Proprietors at their registered address by post." You may note that we are anticipating the date of this payment. As regards the Phœnix Shareholders, the dividend will be paid one month earlier than previously, and possibly this may be hastened still more in the future.

Mr. HENRY FINLAY seconded the motion, and it was carried unanimously.

Mr. JOSEPH ROYLE observed that it was stated that in the future the "B" stocks would bear the same dividend, and he asked what they were to understand by this. One dividend was now 10½ per cent., and the other 11 per cent., what would the future dividend be?

The CHAIRMAN: The future dividend will be about 11¼ per cent. for both of the "B" stocks. We have been able to anticipate the reduction in the price of the gas in the old Phœnix district by six months, and this brings both the "B" stocks on the same footing.

Mr. G. D. GIBBES, in reply to a Shareholder, said that all the stocks of the Company were quoted in the official Stock Exchange list.

Mr. HOUNSOM said there was one pleasant duty for the Shareholders to perform before they separated, and this was to thank the Directors. He moved—"That the best thanks of the meeting be given to the Chairman and Directors for their able management of the Company's business."

Mr. ROYLE seconded the motion, and it was carried unanimously.

The CHAIRMAN: Ladies and gentlemen, on my own part and on that of my brother Directors I beg to thank you for the kind way in which you have shown your appreciation of our efforts to manage the Company's affairs. I am quite sure that if everything goes on in future as at present you will have no reason to regret either that your interests are in an amalgamated Company, or that they are entrusted to those who are now managing it. We shall never cease in our efforts to manage your affairs in the best possible way.

Mr. R. H. JONES, J.P., moved that the best thanks of the meeting be given to the Secretary and Engineer, and the officers of the Company. He said he wished to point out that one of the advantages of the amalgamation was the lower pressure afforded, and the large amount of gas brought into charge. He saw that they had obtained 9200 cubic feet of gas out of every ton of coal carbonized.

The motion was seconded and carried unanimously.

The SECRETARY and ENGINEER: Mr. Chairman, ladies, and gentlemen, I am very much obliged to you for the cordiality with which this vote has been passed. I may say on behalf of the staff that in order to hold this meeting at so early a date—some six weeks before the usual time—they have been working very hard indeed. I refer more particularly to the gentlemen connected with the late Phœnix Company, and to the Accountant; and it is to them mainly due that you will get your dividend early. I may also say for the staff that all the members are working earnestly and devotedly for the benefit of the amalgamated Company. The principal officers who came over with the Phœnix Company are doing their duty admirably and thoroughly, and working most heartily for your benefit. I need not say anything of the old people of the South Metropolitan Company, because I might be considered to be somewhat partial, but I may state at least as much for them. I have much pleasure in acknowledging your hearty vote of thanks.

The proceedings then terminated.

READING GAS COMPANY.

The Half-Yearly Meeting of this Company was held on Thursday last, when the Directors recommended that full dividends should be paid on all classes of stocks and shares. In regard to the Company's Bill in Parliament, which received the Royal Assent on the 2nd inst., the report stated the Directors have full confidence that it "will prove conducive alike to the prosperity of the Company and the good of the community."

It may be remembered that, among other things, the Bill which has just passed into law was to authorize the erection by the Company of new works in the parish of St. Lawrence, and to form a road from near the entrance to their present works to the site of their proposed new ones, carrying the road over the River Kennet by a bridge. Concerning this the report says: "In order that the season for such work might not be lost, the foundations for the new bridge have been got in under most favourable circumstances, and the construction of the bridge and the making of the road have been proceeded with. The plans for the bridge and road have been prepared by Mr. Baker, the Company's Engineer, and have received the approval of the other parties interested in the work, and have passed the Standing Orders of Parliament."

The accounts presented were evidence of the continued prosperity and the satisfactory progress of the Company's business. During the past six months £593 was expended in extensions of works and plant; and £824 is charged for expenses connected with the new Act of Parliament. These sums raise the total capital expenditure to £85,354. The reserve-fund remains as before—£6000; whereas 1 per cent. for the half year on £78,000 was added to the contingency fund, raising it to £1221.

Revenue Account, for the Half Year ended June 30, 1880.

Dr.		Cr.	
Coals delivered	£5,842 17 0	Sale of gas—	
Purifying materials	108 17 10	Private consumers—common gas, 69,294,800 cubic feet, at 3s. 5d. per 1000 cubic feet	£11,843 2 11
Salaries, &c.	314 3 4	Public lighting and under contracts	851 5 2
Wages	1,398 6 9		£12,694 8 1
Repairs and maintenance of works and plant	1,006 3 6	Residual products—	
Salaries of Inspectors, &c.	52 4 0	Coke, less labour	£1,925 7 11
Repair and renewal of mains and service-pipes	1,720 12 6	Breeze	23 17 9
Repairing, &c., meters	335 7 2	Tar	556 11 2
Lighting, &c., public lamps	244 3 9	Ammoniacal liquor	757 19 4
Rates and taxes	558 11 10		3,263 16 2
Directors allowances	125 0 0	Rents	2 18 1
Salary of Secretary and for offices	125 0 0	Reserve-fund	94 9 4
Collectors commission	272 0 7		
Stationery, printing, &c.	75 4 2		
General establishment charges	118 19 11		
Auditors fees	10 10 0		
Contingency-fund	300 0 0		
Bad debts	46 10 8		
Total expenditure	£13,344 13 0		
Balance	2,710 18 8		
	£16,055 11 8		£16,055 11 8

DEATH OF DR. WHITMORE.—We notice the announcement, in the obituary columns of the daily papers, of the death, on Wednesday last, of Dr. John Whitmore, Medical Officer of Health and Gas Analyst for the parish of Marylebone. The deceased gentleman was in his 70th year.

BARNET DISTRICT GAS AND WATER COMPANY.

The Half-Yearly General Meeting of this Company was held on Monday, the 23rd inst., at the Gas-Works, New Barnet—Mr. J. F. BONTEMS in the chair.

The SECRETARY and ACCOUNTANT (Mr. Alfred Lass, F.C.A.) read the notice convening the meeting, while the following report and accounts were taken as read:—

The Directors beg to submit to the Proprietors the accounts for the half year ending June 30 last.

The balance of the profit and loss (net revenue) account amounts to £4109 3s. 6d., out of which the Directors recommend the declaration of a dividend, free of income-tax, for the half year ending June 30 last, at the rate of 5 per cent. per annum on the "A" stock and shares, and 4 per cent. per annum on the "B" stock, leaving a balance of about £1100 to be carried forward to the next half year's account.

The gas rental for the last half year has amounted to £4378 9s. 1d., which shows an increase of £231 2s. 10d. on the corresponding period of last year. The water rental has amounted to £3082 15s. 10d., which shows on the same period an increase of £461 13s.

The price of gas has been reduced, as from the 25th day of March last, from 6s. to 5s. 9d. per 1000 cubic feet.

Gas Revenue Account, for the Half Year ending June 30, 1880.

Dr.		Cr.	
Coals	£1342 18 5	Sale of gas—	
Purifying	62 17 1	Private rental	£4062 9 7
Salaries of Engineer, &c.	87 10 0	Public lighting	315 19 6
Wages	299 8 0		£4378 9 1
Repair and maintenance of works and plant	174 16 10	Rental of meters	110 3 3
Salaries of Inspector & Clerks	126 6 3	Residual products—	
Repair and maintenance of mains and services	148 8 11	Coke	620 16 11
Repairing & renewing meters	45 0 0	Breeze	16 12 3
Lighting and repairing public lamps	75 4 6	Tar	96 13 0
Rent, rates, and taxes	61 17 4	Sulphate account	88 11 6
Directors allowances	100 0 0		822 13 8
Salaries of Secretary and Accountant	62 10 0	Rent account	24 0 0
Collector's commission	100 6 8		
Stationery and printing	34 6 2		
General establishment charges	57 15 8		
Auditors fees	3 18 9		
Law charges	37 11 10		
Bad debts and allowances	41 13 3		
	£2862 9 8		
Balance to profit and loss account, net revenue	2472 16 4		
	£5335 6 0		£5335 6 0

Water Revenue Account, for the Half Year ending June 30, 1880.

Dr.		Cr.	
Coals	£364 13 3	Sale of water	£3082 15 10
Wages	175 2 0	Rents	21 5 0
Repair and maintenance of works and plant	422 4 0		
Salaries of Inspector & Clerks	38 15 0		
Repair and maintenance of mains and services	62 1 8		
Salaries of Engineer, &c.	87 10 0		
Rent, rates, and taxes	62 18 4		
Directors allowances	100 0 0		
Salaries of Secretary, Accountant, &c.	62 10 0		
Collector's commission	44 14 4		
Stationery and printing	34 6 1		
General establishment charges	57 15 8		
Auditors fees	3 18 9		
Law charges	37 16 9		
Bad debts	50 8 2		
	£1604 14 0		
Balance to profit and loss account, net revenue	1499 6 10		
	£3104 0 10		£3104 0 10

The CHAIRMAN said he supposed the first thing that every Shareholder did on getting his report was to look and see what the dividend was to be, and on this occasion it was found that it was not proposed to increase it. Of course, the Directors would be as glad as the Shareholders if the dividend could be prudently increased, but they did not consider it could be increased on this occasion. They, therefore, proposed the same dividend as last time, and to carry forward a little larger amount to the next account. The second matter that a Shareholder would look at was to see whether the rental had increased, and this it would be found had increased both as regarded the gas and the water undertakings, the total increase being £692. It might be thought, perhaps, that with this increase there could have been a small increase in the dividend, but on looking to the outlay of capital he thought they would come to the conclusion that it was prudent of the Directors not to increase the dividend this time. They had made sufficient to pay the dividends on the fresh capital that had been issued, and this was all they could well do on the present occasion. The capital used during the past six months—almost entirely on the water branch of the business—came to nearly £6000; and the total capital expended from the commencement of the Company was now, gas-works £71,385, and water-works £73,603. As the Proprietors were aware, for some time after the amalgamation the prices of iron and coal were very high; but happily for the Company they had now been low for some time past, so they might say that during the whole of their time there had been about a moderate average in the price of these articles. Of course they would say, as they had always said, and as the Board had always agreed, that the amount of capital expended was very large, as compared with the amount of the rental; but the Directors hoped the rental would gain on the expenditure from this time more rapidly than it had as yet done. The amount of the capital expenditure was partly attributable to the fact that they were an amalgamation of three smaller Companies, but the chief cause had been the large extent of the present Company's district. If they went north from where they were assembled, they had 8 miles of gas-mains and 2 miles of water-mains; if they went south they had 3½ miles of gas-mains and 8 miles of water-mains; if they went east, they had 2 miles of gas-mains and 2 miles of water-mains; and if they went west, they had 4 miles of gas-mains and 4 miles of water-mains. This was a large extent of mains, and was necessarily very costly. Of course, he had only given the mileage of trunk mains; for if they came to the actual mileage, taking all the side roads and streets in which their mains were laid, they had the very large extent of 45 miles of gas-mains and 58 miles of water-mains. This fact accounted very much for the large amount of capital expended. Ever since the formation of the present Company—the amalgamation of the three Companies—it had been their business to have the work done as well as possible, to have the material and workmanship of the best, and to have the mains and the works on a scale suitable for the district they had to supply. He therefore thought they would very soon be reaping the benefit of their large outlay. He was happy to say that the improvement of the water-works was leading to the most satisfactory results. They had hoped the pumps would have

been completed before the meeting, but the delay had been longer than the Board had expected. Still, he had the pleasure to tell them they were so far completed that, if necessary, they could shut off one well entirely, and supply the district from the other; and he had no doubt they would soon realize what they had set themselves to do—to get from their water-works a million gallons a day, and to get this quantity by either of the pumps. Before the Shareholders left the works, he would ask them to look at the two pieces of land the Directors had purchased—one adjoining the works at the back, giving them three or four times the amount of land they had before; and also some similar land at the back of the water-works—freehold land—which would make provision for any extent of buildings they might in the future want to erect. The two works were now brought into communication by this land, which had a public foot-path at the back and a public footway over the railway. By these means they were able to communicate with each other without going all round the road. He thought that those who had visited the gas-works before would, on inspecting them again, see that great improvements had been made since the last meeting they had at Barnet; and he thought when they saw the water-works they would be even better pleased with the improvements there than at the gas-works. He, in concluding, moved the adoption of the report and balance-sheet.

The DEPUTY-CHAIRMAN (Mr. James Glaisher, F.R.S.) expressed his pleasure at seconding the motion. His pleasure was, he said, greater than it would be if they proposed dividing up to the hilt the profits made. He considered that no profits should ever be divided so closely as that. The increase of £461 on the water rental indicated, as the Chairman had said, a source of profit in the future, which he hoped would recoup every one for the patience he had been compelled to exercise. Their water was the finest about London—he said this without hesitation. Acquainted with the analyses of the water supplied by all the Companies, he asserted that there was no water superior to the Barnet Company's water. It was certainly superior to that of the Kent Company in various ways; and possessed of such a volume of water as they had, the Company had amply sufficient for the supply of the district for many years to come. He did not suppose that a going concern could ever close its capital account—while there were fresh customers constantly coming in, there must be small outlays; but he did hope when the works were completed they would take the favourable turn which the Chairman had indicated, and that every meeting they in future held would be more pleasant than its predecessors.

A SHAREHOLDER, referring to the Deputy-Chairman's remarks on the purity of the Company's water, said he had heard a complaint by a resident that the water was not pure.

The CHAIRMAN said they had had reports over and over again prepared by the best water analysts in London. In the case just mentioned they did not know where the water was taken from; and the fault complained of might depend entirely on circumstances with which the Company had nothing to do.

Mr. ROBERT WILKINSON observed that he was not only a Director of the Company, but a water drinker. He lived in the district, and every friend of his who tasted the water said that it was of the best quality he had ever drunk. Whenever he heard a person complain of the water, he inquired when he last had his cistern cleaned, and he had invariably found that the complaints arose in consequence of the cisterns not being properly attended to. Let the gentleman who now complained have his cistern cleansed, and he would find that his water would be good.

Mr. WAKEFIELD, who said he had been a resident in the district for eight years but was a new Shareholder in the Company, observed that he had been Chairman of a Gas Company, and he knew a good deal about gas and water. He had taken much interest in seeing the Company's works and the progress they were making. It certainly struck him that they began under very exceptional circumstances—a large district and very few customers. The district, however, was now increasing rapidly, and there could be no doubt that the gas would be a very lucrative part of their business. He fully expected to receive 10 per cent. dividend before long. His idea of the Company's water was that it was exceedingly good. The only fault that he should be prepared to find with it was that it was very hard—it was not good for washing purposes till it was boiled. The question he desired to go into more particularly was whether they were likely to have a full supply. Quite sufficient had been stated for his (Mr. Wakefield's) information as to the quantity, but perhaps not sufficient for the information of the public. On one occasion he heard a rumour that the price of the water was so high because the supply was only limited, and it was said that the Company did not wish to see the customers increase, as they would have to go to the cost of increasing the supply. He therefore hoped the Directors would let it go forth to the public that they would not regret to see the customers increase, but that, on the contrary, the more who came the better they would be pleased, as they would be quite ready to supply them. He thought the circulation of such information would tend to benefit the Company out of doors.

The DEPUTY-CHAIRMAN said with regard to the remark about the hardness of the water, he had been for many years connected with the office of the Registrar-General, and he had been connected for many years with water-works all over the country, in one way or other. The report of the Committee which recently sat to inquire into the subject of the London Water Supply, spoke highly of the water supplied by the Kent Company, and yet the proportion of lime in this water compared with that of the Barnet Company was in the proportion of 12 or 13 to 6. It was not his wish to put more lime into their water to make it soft, which would perhaps make it better for domestic purposes, but not for general purposes. Their water was a fine water, and, he repeated, the finest about London. As to the question of quantity it was but recently that an accident occurred to the well at the Colney Hatch Asylum. The Manager of the Asylum communicated with the Company, when they at once engaged to supply them (if they needed it) with 100,000 gallons a day at any moment, and they were prepared to do so. He could pledge himself that however many houses might be built, and however many customers might present themselves, the Company had ample means to supply them with all the water they wanted. He should decidedly like it to go forth to the public that the Company had no deficiency, but an ample supply. They were, in fact, not sending out one-third of the quantity of water they could distribute; and they had been duplicating their machinery, so that if part should get out of order, the other would supply their customers. In every respect the inhabitants of the district might rest satisfied that the water supplied by the Company was good in quality and abundant in quantity.

The CHAIRMAN then put the motion for the adoption of the report, and it was carried unanimously. He also moved the payment of the dividends recommended.

The DEPUTY-CHAIRMAN seconded the motion, which was at once carried unanimously.

The CHAIRMAN said he had not thought it necessary to refer to the reduction in the price of gas (to which his attention had just been called), as it was mentioned in the report. Mr. Wakefield had said that he expected they would get a large revenue from their gas as the number of the inhabitants in the district increased. They all looked forward to this, but they scarcely expected it till they could charge a lower price for the gas. They would meet their customers as soon as they could in this respect. He had no doubt that before very long they would be able to reduce the price of gas still further, and as they did so probably the consumption would increase. At the same time they must not forget that the "B" Shareholders were receiving only 4 per cent. When they received another 1 per cent. he thought the Directors might fairly look to the consumers.

Mr. CHURCH moved a vote of thanks to the Chairman and Directors for the way in which they had conducted the business, and the excellent results produced for the Shareholders. He regarded the Chairman's statement as most satisfactory.

Mr. CECIL seconded the motion, which was carried unanimously.

The CHAIRMAN, in reply, said it was always satisfactory to them to be able to please their constituents. He assured the meeting that the Directors felt quite as anxious on their own part as on that of the Shareholders that their works should be a great success.

On the motion of Mr. CECIL a cordial vote of thanks was also passed to the Secretary, Engineer, and staff of the Company.

The SECRETARY expressed his obligation, and said he would continue to do his best to promote the welfare of the Company.

The ENGINEER and MANAGER (Mr. T. H. Martin) also replied on behalf of himself and the staff. They all endeavoured, he said, to do their best for the Company, and it was as much pleasure to them as it was to the Shareholders to see the Company progress.

The meeting then adjourned to luncheon, and subsequently inspected both the gas and water works, great satisfaction being expressed at the condition of both.

GLASGOW CORPORATION GAS AND WATER SUPPLY.

At a recent meeting of the Glasgow Town Council there was submitted by the Sub-Committee on the Consolidation of Trusts a copy of notes prepared by the Town Clerk (Mr. J. D. Marwick) as to the consolidation of the finances of the Corporation and the several Trusts under the administration of the Magistrates and Council. In these notes, the Town-Clerk first narrates the history of the movement for the consolidation of Trusts, which dates back to December, 1874, when a Special Committee was appointed to consider the subject. The result of the labours of this Committee was that, in June, 1877, a Provisional Order was obtained, by which the municipal and police government and jurisdiction of the city were united in the Magistrates and Council, who thus superseded the Police Board, and some important changes were effected in the system of police administration. The management of the water supply was also transferred from the Statutory Water Committee to a Committee appointed from time to time by the Council, acting as Water Commissioners, to whom the whole proceedings of the Committee must be reported for consideration and confirmation. Having thus effected these important objects, which had long engaged the attention of the Council, it was considered desirable to improve the financial administration, by obtaining statutory authority to the Corporation and the several Trusts to borrow from and lend to each other. It was often found that considerable funds stood at the credit of one account, bearing a low rate of interest, while a large amount stood at the debit of another account, on which a much higher rate of interest had to be paid. The funds in both cases were those of the community, but the public law will not allow trustees in one character to borrow from or lend to themselves as trustees in another character. To remedy this state of matters, and secure the benefits of an equalization of interest, provisions were inserted in the Glasgow Municipal Act, 1878, empowering the Corporation, as such, the Police Commissioners, the Water Commissioners, the Gas Trustees, the Improvement Trustees, the Market Commissioners, and the Parks and Galleries Trustees, from time to time to borrow from and lend to each other such sums of money, for such times, in such manner, and on such terms and conditions as they may mutually agree, but so as not in any case to borrow more than the sums of money they are respectively authorized to borrow. These provisions received the sanction of the Legislature, and have been in operation since the 15th of May, 1879. To enable the Committee to consider what further changes may be advantageously sought for, it was necessary to ascertain the amount of the debts due by the Corporation and by the various Trusts under the administration of the Council; the borrowing powers conferred by statute on the Corporation and the several Trusts, and the security provided by statute for the sums so borrowed. The Town Clerk therefore submitted an approximate statement of the debt due by the Corporation and by the several Trusts in the administration of the Magistrates and Council, as at Nov. 30 last year; and from this we extract the following particulars in reference to the authorized borrowing powers of the Gas Trustees and the Water Commissioners:—

The Glasgow Corporation Gas Act, 1869, transferred to the Corporation the undertakings of the Glasgow Gaslight Company and the City and Suburban Gas Company of Glasgow, with all the powers which these Companies possessed. It also conferred on the Corporation a variety of new powers connected with the manufacture and supply of gas within the city of Glasgow and neighbourhood. The Glasgow Corporation Gas Act, 1871, empowered the Corporation to acquire additional lands, and to erect thereon additional gas-works. The transfer effected by the Act of 1869 was made subject to payment to Shareholders of the old Companies of perpetual annuities, amounting in the whole to £34,762 10s. The Annuitants are, by section 33, declared to be creditors of the Corporation for payment of these annuities, interest thereon, and expenses incident thereto. By section 70 of the Act of 1869 the Corporation were empowered to borrow, for the purposes of the Act, a sum not exceeding £1,000,000. The Corporation are required, by section 83 of the Act of 1869, to set apart as a sinking-fund, after June 24, 1871, a sum not less than 1 per cent. per annum on the amount borrowed, and to invest from time to time in Government securities the sum so set apart, and to apply the same, with the accumulations thereof, and the interest on the several amounts paid off, towards the redemption of mortgages or annuities, and not otherwise. The sinking-fund must not be less than £2000 in any one year. The Corporation have not exercised the power which they possess to fund any portion of the existing debt, which amounts (exclusive of the annuities to the Shareholders of the old Companies) to £582,839. The sinking-fund established under the Act amounted, at the same date, to £55,560 6s. 3d., which was applied to the extent of £42,500 in the redemption of mortgage debt. In other words, but for the application of the sinking-fund, the mortgage debt would have been £625,339.

The Glasgow Corporation Water-Works Act, 1855, transferred to the Water Commissioners the undertakings of the Glasgow Water-Works and the Gorbals Gravitation Water-Works Companies, and empowered the Commissioners to introduce additional supplies of water from Loch Katrine. The transfer of the undertakings of the old Water Companies was made subject to payment to the Shareholders of these undertakings of perpetual annuities, which in the case of the Glasgow Water-Works Company were fixed at £16,167 6s., and in the case of the Gorbals Gravitation Company were fixed at £10,800 per annum—making the total amount of annuities £26,967 6s. The Commissioners are empowered by section 41, from time to time, by agreement with Annuitants, to redeem

all or any of the annuities, and on such redemption the redeemed annuities are wholly extinguished. The old Water Companies and the Shareholders and the Annuitants are, by section 46, declared to be creditors of the Commissioners for payment of the annuities payable to them respectively, interest thereon, and expenses incident thereto, and are deemed to hold, by virtue of the Act, a mortgage and assignment of the whole property and works vested in, or to be acquired or constructed by the Commissioners under the Act, and of the several rates to be levied by them under the provisions thereof, in security of such payment. The mortgage and assignment thus constituted ranks *pari passu* with the other mortgages and assignments granted under the Act, and confers the like powers and privileges. The Commissioners were authorized to execute additional works by the Glasgow Corporation Water-Works Amendment Acts, 1866 and 1877. The total borrowing powers of the Commissioners under the Acts of 1859, 1860, 1866, and 1877 amount to £1,850,000. In the exercise of the powers conferred by these Acts the Commissioners as at November, 1879, had borrowed on mortgage £1,324,221 15s. 4d., and have funded debt at 4 per cent. to the amount of £49,500. On April 23, 1877, the Commissioners resolved to fund £100,000, and on the 5th of April last they resolved to fund £150,000 additional, making £250,000 in all. Of this amount £108,550 had been either funded or arranged to be funded since November last, and on a considerable portion of the amount arranged to be funded a premium of 2 per cent. will be received. A large increase will, doubtless be made to the funded debt as mortgages fall in, and as the process of funding can be carried out with advantage to the Commission. The amount of the sinking fund at the date of the last balance of the water account was £164,735 3s. 5d. The total money borrowed, as at November last, thus amounted to £1,538,456 18s. 9d.

It was stated that these notes will form the basis for the Committee to proceed on; but they have not yet exhausted their remit. The whole matter will come up for discussion on the presentation of the report of the Committee.

EDISON'S "PERFECT LAMP" PERFECTED.

(FROM OUR AMERICAN CORRESPONDENT.)

Another *furore* in the matter of electric lighting has been created by the announcement that Edison has "perfected his perfect lamp;" and that he is now ready to undertake in earnest the actual lighting of New York—or rather a portion of it by way of experiment—with his new lamp. Further, he claims that he will be able to make such a profit from supplying electricity for motive power that he can afford to almost give the light away, and thus at once consign gas companies to the things of the past, to rust upon the shelf in company with the link-boy's torch. Agents have lately been canvassing the lower business portion of New York, with the apparent object of ascertaining how many merchants and others would agree to use electricity for motive power and lighting purposes, if Edison were to establish the necessary works. The inventor claims to be very well satisfied with the result of the canvass, and maintains that a sufficient number of persons have pledged themselves to use his engines as to warrant the erection of suitable works, and that the money invested therein would earn a handsome dividend, even if, owing to the gas companies reducing the price of gas, he should be forced to supply electricity for lighting purposes at next to nothing.

When such statements as these appear in the daily papers on your side of the Atlantic, as they doubtless will, gas shareholders—I do not say gas engineers—are very apt to take alarm. I therefore take this early opportunity of laying before your readers an account of the so-called improvements in the Edison lamp, which are exciting so much comment here, and I will also endeavour to see how much cause there is for any uneasiness on the part of gas men.

The improvements in the lamp are three in number. First, the hermetically-sealed globe containing the carbon horseshoe is made of ground glass, while the "perfect lamp" was clear; second, the globe is a little larger than the previous style; third, the carbon of the horseshoe is now of the same thickness as width. Let us consider these in the order named.

First. As the incandescent carbon loop, or horseshoe is of small area when compared with a gas flame, and consequently more dazzling to the eyes, the light may be a little more agreeable—or rather less disagreeable—to the beholder when it is enclosed in its new garb. On the other hand, the ground glass will obstruct more light than the clear globe. This, however, Edison disputes, or at least claims that the new globe will only reduce the light 3 per cent.; whereas the loss of light caused by a ground globe is usually placed at about 30 per cent. The inventor has two reasons to account for this discrepancy. First, that the electric light being a pure white light the rays therefrom will pass through the ground glass with very little loss, while the globe would greatly obstruct the rays from a gas-light; and, secondly, that the heat radiated a gas flame is so great as to necessitate the use of a large globe, while his globe being so small—of smaller area—less light is obstructed by it. Now in regard to the first reason, it must certainly appear strange that no electrician has discovered it before (if there is any truth in it), when one of the great drawbacks to the use of large electric lights has been the necessity of surrounding them with ground or opal globes, and the advocates of the new light have always admitted that owing to this fact much lighting power is lost.

In regard to the size of the globe, that brings me to the consideration of his second improvement, and I would ask, if the larger area of a gas globe accounts for the difference in the percentage of the light obstructed, wherein is his larger globe an improvement on the older style? The difference between the size of Edison's new globe and those used for gas, cannot be very great, for I am confident all the "perfect lamps" I saw were 3 inches in diameter. Besides there is another thing to be noted in comparing his ground globe and a gas globe. In the former instance all the light has to pass through the globe, while in the latter case a good deal of the light which is apparently lost, is reflected through the top and bottom openings. While the lighting of the ceiling is not a great gain, the light reflected down through the lower opening—especially in the new pattern globe with a 4 or 5 inch opening—is of great service.

The third improvement is of some value, if it does what the inventor claims for it, viz., equalizes the light in all directions. It will be remembered that in the "perfect lamp" the carbon forming the loop was of greater breadth than thickness, so the light in front was greater than that transmitted laterally. Now, making these two dimensions equal, the light is the same on all sides. But if this had been the only defect in the former lamp, I think it would have come into general use before this.

What Edison proposes to do is simply this: To establish works down town, before the close of the present year, to supply electricity for motive power and light, the latter to be furnished at less than the cost of gas-light, never mind to what figure the purveyors of the latter article might reduce their commodity. The section of the city in which he proposes to commence operations is about a quarter of a mile square, being occupied chiefly with office-buildings and warehouses. In the greater number of the buildings steam is used to run the passenger-elevator engines and other various kinds of work, but chiefly for heating the buildings in winter. So I do not think the new move will meet with a great deal of success, even if the attempt is made. However, the inventor's plan, as before intimated, is to supply the motive power required in these buildings, and give the light as a sort of bonus. But it is to be noted that almost all the light used in this section—except that burned in the streets, of which he makes no mention—is that used in the daytime, in dark offices, &c., so he would have to provide the power to supply the engines and lights at the same time.

Of course, any figures emanating from Menlo Park are almost valueless for purposes of comparison. However, here is what is given. The candle power of the new lamp is placed at 15½ candles—an improvement, according to the inventor's own figures, of ½ candle in the wrong direction. The globe to contain the carbon loop will be sold at 35 cents. (1s. 6½d.), and will last with ordinary care about six months. The number of lamps maintained per horse-power is given as 8, the plant necessary to supply 800 lights being as follows:—

	Dols.	£
100-horse power engine with one large generator . .	4000	800
Boiler, &c., &c.	1600	320
Total	5600	1120

The gas plant necessary to supply 800 lights is placed at from 7000 to 10,000 dols. Land and buildings are presumably left out in either case, while the conductors from the works to the consumers—or perhaps better, users—premises are to be offset by the gas companies mains.

In fact, Edison claims that where an electrical company would spend 1 dol. 74 cents (6s. 11½d.), a gas company would have to lay out 3 dols. (12s.). [Too bad the inventor did not stretch it a cent, and make the former figure 1 dol. 75 cents.] Manifestly the cost of his plant is too low. I doubt very much that the plant mentioned could be procured for the amount named, but it is unnecessary to look to it farther, as the apparatus would have to be in duplicate, making it 11,200 dols. (£2240), which, when compared with the inventor's highest figure for the cost of a gas-works, viz., 10,000 dols. (£2000), does not show a very great saving in favour of the price of his plant. A little further consideration will show how much larger the capital of an electric lighting company must be over a gas company's, more even than intimated in the foregoing figures, because the former company will need to have works scattered all over the city, in many cases having to procure land at fabulous prices, while a gas company can build where land is the cheapest, and have one large works in place of several small ones. Again, the conductors would doubtless exceed the cost of gas-mains, as they would have to be of large size, insulated, and enclosed in pipes.

But it is a waste of time to attempt to form any comparison between Edison's meagre figures and the cost of gas; nor is it necessary, as the whole system of gas lighting whereby any amount of light, however small or however great, may be instantly and certainly obtained, so far exceeds anything Edison can possibly do with his light, that gas men have nothing to fear. For, even where the electrical apparatus is in duplicate, if an accident should occur to the machinery the lights would probably go out before the extra engine could be brought into action, while with gas there is always a surplus to draw from, so that if anything goes wrong in the works the lights will still be maintained. Again, as Edison proposes to make his profit from supplying motive power, he would naturally run his conductors only where he could get a large number of customers for his engines; consequently it would only be a limited portion of each city where he could at all interfere with gas companies.

In truth this his latest move shows the utter weakness of his case; and has been started, I think, as a means of raising the price of the Edison Company's stock, or else as a preparatory step to giving up all intentions of introducing his light, and diverting his mind to other matters. The gentleman is also very enthusiastic as to what he will accomplish in revolutionizing the railway system, through the supplanting of the present locomotives by the introduction of his electrical engines; but it does not come within my province to enter into details on this head, suffice it to say, he expects that locomotives will be placed aside, like gas companies, in a very few years.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

(*Continued from p.* 303.)

Mr. D. M. NELSON (Glasgow) read the following paper on

GAS PURIFICATION BY MEANS OF OXIDE OF IRON.

While the fact that the value of oxide of iron, as a coal gas purifying agent, is not sufficiently recognized in this part of Britain may serve as my apology for bringing its merits before the Association, I feel that the subject would fare better in the hands of any other member more immediately engaged in the production of coal gas, and the arguments in its favour would carry conviction more readily to the minds of hearers. However, as a partial set-off to this, it may be proper to say at once that the substance of my remarks is based upon the experience of various members of the Association who have used oxide of iron in conjunction with lime, during a number of years; and continue to do so for the following reasons:—1st. On the ground of economy, as measured by the relative cost of purifying material and labour requisite to remove the impurities from the gas by it, as compared with the sole use of lime. 2nd. On the ground of collecting and utilizing the valuable product sulphur—the spent material containing it, returning, as it often does, fully the cost of the new material. 3rd. On the ground that by using oxide of iron in conjunction with lime placed in alternate purifiers in the usual circle of rotation, the lime is fouled—chiefly as carbonate—and is restorable for an indefinite length of time, as in the lime revivification process of Mr. G. R. Hislop. 4th. On the ground that by the united application of oxide of iron and lime, the risk of having a short supply of purifying material at any time is very much reduced; and, by restoring the lime (as by Mr. Hislop's process), everything is in the hands and under the control of the manager.

Chemically considered, the employment of oxide of iron and of lime in gas purification, is a beautiful adaptation of means to an end; they are handmaids in the subtle art of removing from the gas the impurities which are at once intolerable to the sense of smell, and stifling to the lungs—that is, sulphuretted hydrogen and carbonic acid, both of which should be wholly removed, together with the major portion of the bi-sulphide of carbon, and this is accomplished perfectly and economically by the use of both agents.

Thus, with a set of purifiers, marked Nos. 1, 2, 3, and 4, filled with

2	L.	Ox.	3
1	Ox.	L	4

oxide and lime in the order shown, it will be seen that at one time the foul gas will enter the oxide first, and at another the lime first. Supposing it enters the oxide first, then, just before turning off the purifier that preceded it (which would be lime), Nos. 1 and 2 would both have been

rendering the test-paper black, and thus indicate that a portion of the lime in No. 2 would be in the form of sulphide, and would be active in removing bisulphide of carbon; and, again, the carbonic acid passing through No. 1 (oxide), and of course unabsorbed, would begin to discharge the sulphuretted hydrogen already absorbed by the lime, and send it forward to be taken up by No. 3, which is oxide. And, again, making the lime purifier No. 2 the first or foulest, when No. 1 is shut off, the calcium sulphide already formed and being formed will remove the sulphide of carbon, and the carbonic acid in the foul gas will complete the expulsion of the sulphuretted hydrogen lodged as described, sending it forward to the cleaner purifiers.

To carry out this plan, about equal quantities of oxide and lime are necessary, and should be placed in separate purifiers, otherwise they have to be kept carefully apart by means of canvas, which is troublesome and inconvenient. The finest Irish oxide of iron only should be used, as with inferior oxides a greatly increased cost is entailed in working it, on account of the more frequent changing of the purifiers for the necessary exposure and revivification; otherwise an enlarged purifying area must be provided. Again, it is more difficult to charge it with sulphur up to a marketable strength, as buyers do not care to take it under 40 per cent. of sulphur, but with good oxide it is easily charged with from 50 to 60 per cent.; yet to secure this it may be necessary to expose it to the air from 30 to 40 or more times, depending upon the amount of purifying surface available. It is always advisable to begin with a new batch of oxide at the commencement of the winter, and it can more easily be charged to the full extent during the lighter months of the year. In preparing new oxide for the purfiers, it is common to add from one-fourth to one-third of its bulk of sawdust, which renders it very porous, and offers but little resistance to the passage of the gas. In practice it is usual to fill the purifier up on one tray, say 30 inches deep, and with the best results.

The cost of purification in the Paisley Gas-Works is: Purifying material, 0·28d.; wages, 0·20d. = 0·48d. per 1000 cubic feet of gas made—*i.e.*, under ½d. per 1000 feet, and this is about one-third only of the average cost.

The above is a brief outline descriptive of the use of oxide of iron in the Paisley Gas-Works, while the experience in Dundee is somewhat similar, and may be explained as follows:—Sometimes the oxide is mixed with a little sawdust and sometimes not. In one lot recently used, about 8 per cent. of sawdust was added. If too wet when received, the oxide may require to be changed once or twice before getting into good working order, but, if this is not the case, it will purify well from the beginning. After being fouled, the oxide is spread on the floor to revivify in a layer 9 or 10 inches thick. It is then turned over three or four times or oftener until perfectly cooled—it generally lies five or six days on the floor. Then it is damped with water until it becomes about as moist as dry lime. The usual test is simply to take a handful, and should it be moist enough to retain the pressure of the hand without leaving any moisture, it is then considered as in good condition. Care must be taken not to make it too damp. It is in this state gathered up into a heap about 4 feet high, ready for another purifier. Heating never occurs when thus heaped. After the oxide has taken in about 40 per cent. of sulphur, or over that, it is not necessary to damp it at all; the moisture that is in it when taken out of the purifier, is, to a certain extent, retained after revivification.

Following this it may be useful to submit a comparison of five years experience of working with lime, and an equal period of working with lime and oxide of iron conjointly. My friend, who has experience of this, writes me as follows:—"In accordance with your request, I have great pleasure in giving my opinion as to the advantage of oxide of iron over lime as a purifying agent.

Gas Purified from May 10, 1869, *to May* 10, 1874.

50,806,000 cubic feet of gas purified in five years—			
1924 bolls of English lime used, at 4s. per boll . . .	£384	16	0
Wages paid for labour for charging purifiers	42	18	0
Total	£427	14	0

Gas Purified from May 10, 1874, *to May* 10, 1879.

55,264,200 cubic feet of gas purified in five years—			
25 tons oxide of iron used, at 60s. per ton	£75	0	0
686 bolls of English lime used, at 4s. per boll	137	4	0
Wages paid for labour for charging purifiers	23	8	0
Total	£235	12	0

"The above shows about 50 per cent. in favour of oxide of iron over lime. I may state that the same class of coals was used in both cases.

"Having two purifiers, first of all I take and mix the new oxide with sawdust, say 2 of oxide to 1 of sawdust, and water till it is at a proper dampness. This is known when the oxide keeps the form given when compressed lightly in the hand. This is the state that is found to work best. When charging the purifiers, the bottom tier is covered with lime, 3 inches deep, then the next two tiers with oxide, each 6 inches deep, then lime on the top tier 3 inches deep, and so on every time the purifiers are changed. When the oxide of iron gets fully charged with sulphuretted hydrogen, it is taken out and spread out, then it is watered well, to keep it from igniting. New oxide has a tendency to ignite when drawn from the purifiers, and exposed to the atmosphere for the first two or three times. To revivify the oxide, it is spread out upon the ground about 3 inches thick, and frequently turned over and watered to keep it at the proper dampness, as aforesaid.

"Its colour on being taken from the purifiers is much altered, and it is not fit for use again until it has resumed something like its original colour. It may be observed that the oxide upon which my calculation is based was at a very high price, and I believe with you that at the present time we can buy it at 30 per cent. less, which will have a still greater tendency to induce parties to give it a trial, and I can safely say if they used it once, they would be very reluctant to give it over and return to the lime.

"There is another advantage that the oxide has over the lime. When charged with impurities, it does not throw off that offensive smell, which is a necessary accompaniment of lime when used for purifying purposes."

Beyond discovering the actual profit to be gained, I feel that I have done little else to merit your attention; and in concluding this somewhat unconnected paper, I cannot omit to record my thanks to Messrs. M'Crae and Mitchell, of Dundee, Mr. Hislop, of Paisley, and Mr. Taylor, of Elgin, for the very valuable information they have afforded me of their experience in connection with the subject of purification by means of oxide of iron used in conjunction with lime—information so copious as to put it out of my power to embrace all the information in one short paper. I shall, however, have much pleasure in answering any questions bearing upon the subject.

Discussion.

Mr. Dalziel said he commenced using oxide of iron six months ago, and the result had been that his purification account had been considerably reduced. He could not yet say much about the working of the oxide. In reply to Mr. Terrace, he said his annual make was about 42 million cubic feet.

Mr. M'Gilchrist asked what was the comparative cost per 1000 feet for oxide of iron and lime.

Mr. Dalziel said it used to be 1½d., it was now 1¼d.

Mr. Mitchell said that oxide of iron was not used to any very great extent in Scotland, but it was extensively employed in the works with which he was connected. One reason why they had resorted to oxide was because of the difficulty they experienced in disposing of their waste lime; they could neither find a market for the quantity produced, nor anything like a price for that portion which was sold. Five or six years since they commenced to use oxide of iron; and at the end of their last financial year the cost of purification per 1000 cubic feet of gas made, including material and labour, was slightly less than ½d. The cost of lime alone was 2-15ths of a penny, and the cost of oxide was about 1-15th of a penny. This calculation was made upon the basis of allowing quite enough for depreciation of the oxide. The oxide and lime together cost 3-15ths to 2-10ths of a penny, and labour 3-10ths, making the whole ½d. per 1000 feet of gas made. He thought this would compare favourably with the cost in any other works. They used the oxide in two sets of purifiers, three in action in each set, and one out of action. In the first tray was put 5 inches of lime. Then there were two other trays, one with about 6 or 7 inches of oxide and one with 14 inches of oxide. The gas entered at the bottom, and ascended to the top; and this arrangement was the same in each purifier. Consequently the gas on entering passed through the lime, and the lime being fresh retained both the sulphur and carbonic acid until it became foul. After this, as he understood it, the gas parted with its sulphuretted hydrogen, as it passed through the two upper tiers. This process went on continually through the three purifiers, and the material was not changed until the three showed signs of impurity. This mode of using the lime and oxide was objected to by some persons, from the fact that the oxide dropped through and fell upon the lime below to a certain extent; but the lime was so hard that the oxide was easily scaped off the top, and was then carefully riddled. Though a small proportion of the lime was among the oxide, it would not do any harm. There was no difficulty in using oxide in this manner; whereas the mode suggested by Mr. Nelson—to charge one purifier with lime, then one with oxide, and again one with lime—might do well enough at the outset; but the moment the centre valve was changed it was necessary to begin with oxide. They had tried this plan in Dundee, but were not long in discovering that it was not right, and fell back on the plan which they now adopted of passing the gas through the lime, and then through the oxide in each purifier.

Mr. Smith: But still having three purifiers in action?

Mr. Mitchell: Yes. Continuing, he said they found that with 40 per cent. of sulphur in the oxide, it had difficulty in doing its work—it did not purify so rapidly—and yet they wanted a larger percentage, as it was easier to sell if it had 50 per cent. Within the last two months they had adopted a mode of putting new life into the oxide, which had been suggested by Mr. Stevenson. This was done simply by adding 2 per cent. of ground lime shells, unslaked, to the oxide. A small quantity so treated worked into a heap, and any one seeing this heap broken into would at once perceive that the oxidizing power of so small a quantity of unslaked lime was very great. Since they adopted this process their purifiers ran almost double the length of time with the same oxide as they did previously.

Mr. Smith said he had used oxide of iron and lime for a considerable time, but had a decided preference for the latter. There was no purifying agent, he thought, like lime, and he would recommend its use if it could be easily disposed of after being fouled.

Mr. M'Gilchrist said he did not use oxide of iron; but believed that, where any difficulty was experienced in disposing of waste lime it would be much cheaper to use oxide, as it was quite as efficient a purifier. It was exclusively used in some works in the South, and it was being introduced in many places, at least to the extent of one purifier out of four, finishing off with lime. In certain places in the south of Scotland, however, where there was a profit made on the spent lime, no benefit would accrue from introducing oxide of iron.

The President said he obtained as much for his waste lime as he paid for it fresh, and he had a great demand for it.

Mr. MacPherson said he was always of opinion that in passing gas through oxide of iron the sulphuretted hydrogen was removed, and then in passing it through lime the carbonic acid was seized. He would like it explained why at Dundee the gas was first passed through lime.

Mr. Mitchell said that their reason for placing the lime next the gas was that, having a greater affinity for carbonic acid than for sulphuretted hydrogen, it quickly removed the former from the gas, and then the oxide of iron having a greater affinity for the sulphuretted hydrogen than for carbonic acid, took up the sulphuretted hydrogen. This process went on until the lime became foul, when it parted with its sulphuretted hydrogen, and this compound was retained by the oxide.

Mr. MacPherson: Then, why not use the oxide first?

Mr. Mitchell said the mode he had described seemed the most natural way of doing the work.

Mr. MacPherson: You have explained that the oxide combines with and removes the sulphuretted hydrogen. Why not do this at one operation by first passing the gas through the oxide of iron, and then leave the lime to deal with the carbonic acid?

Mr. Mitchell said it would seem that the mode of placing the lime first was preferable.

Mr. M'Gilchrist stated that Mr. Hislop instituted a series of experiments at Paisley, on this point, and found that there was no advantage in using the oxide before the lime, or the lime before the oxide, and in working his purifiers, he turned on the gas to the oxide and lime alternately.

Mr. MacPherson said that was his opinion, only he wanted to know wherein was the advantage of using the lime and oxide as in Dundee.

Mr. Whimster said for seven years he had worked oxide in combination with lime, and had always understood that if gas was passed through oxide of iron first it broke up the union between carbonic acid and sulphuretted hydrogen, retained the latter, and then allowed the lime to complete the work. If the carbonic acid were not arrested by fresh lime at the end it would pass away with the gas. As between lime and oxide of iron he had known little difference so far as bad smell was concerned. In fact, if anything, he would prefer lime in this respect, because lime was oxidized in a short time, and the smell disappeared; but oxide of iron kept on oxidizing through its mass from day to day, and the result was that it was a greater nuisance in the neighbourhood than foul lime. He had ceased to use oxide for various causes. He could not see that it was much profit to him, as he obtained 2s. per cartload for waste lime; but apart from this he thought the cost of lime and the cost of oxide, as purifying agents, was as nearly as possible alike. If anything the oxide was the cheaper of the two.

Mr. MacPherson said that all that he wanted to know was the reason why lime should be used first, because he was aware that the ordinary process in England was to put the oxide first. He held that there was no advantage in using the one before the other.

The President said he always understood till lately that the ordinary process was to pass the gas first through the oxide, and complete the

process by sending the gas through lime; but upon this, as upon almost every other subject, there was a difference of opinion. He thought Mr. MacPherson might well set himself to prepare a paper on the subject for next year's meeting.

Mr. F. T. Linton (Leith) submitted the following paper, which was read by the Secretary:—

NOTES OF THE COST OF WORKING A GAS-ENGINE, COMPARED WITH THE SAME WORK DONE BY STEAM POWER.

It may perhaps be as well to explain that in the remarks which I have the honour to lay before you, I do not purpose going into any description of the principles of construction of the various gas-engines now in the market; I have no doubt that the members are conversant with these already, from the various communications of late years on the subject, and especially the very able paper read last year by Mr. Carr, of Halifax, before the British Association of Gas Managers. My desire is simply to put before you what my experience has been of a gas-engine which was erected at the works of the Edinburgh and Leith Gas Company in the spring of last year, and as I suppose that my brother managers, like myself, are being frequently applied to for information and advice as to these engines, I thought that if I put together a few notes as to the cost of working our gas-engine, with a comparison of the cost of doing the same work by steam power, it might be of some little service.

The engine is an "Otto" silent gas-engine of 3½ nominal horse power. It is employed for three smiths fires, and to drive various machines in our workshops—such as a "Roots blower," a large screw-cutting lathe, a screwing machine, a drilling machine, a circular saw, two smaller lathes, and two grindstones. The amount of power required varies considerably, as at one time nearly all these machines may be in use, and at another time not more than two of them. In all cases, however, the smoothness and regularity with which the engine works is very noticeable; there being no sensible diminution or acceleration of speed as the different machines are put in or out of action. The attendance required is very slight. The engine can be started in a minute's time, and the lubricating being done by an ingenious self-acting arrangement, no further attention is needed till the engine requires to be stopped, which is done instantly by shutting off the gas. The only other labour needed is to examine the slide valves once a week to see that the passages to the cylinder are clear, and this does not take more than 15 to 20 minutes.

There is a water cistern in connection with the cylinder jacket, for keeping the cylinder cool, but I have found that the amount of water required, after the first filling of the cistern, is practically *nil*, as the temperature of the water has never risen so much as to require a stream of fresh water run in; the rest during meal hours and at night being sufficient for cooling the water down to the atmospheric temperature. Were the engine, however, working continuously—as in driving an exhauster—a small stream of water would be necessary, and would have to be taken into account in estimating the expense of an engine for such a purpose.

The cost of the engine for the year, from May 15, 1879, to May 15, 1880, working 57 hours per week, has been as follows:—

Gas for engine and slide lights, 99,000 cubic feet, at 4s. 2d. per 1000 feet	£20 12 6
16 gallons of oil for lubrication, at 3s. 6d. per gallon	2 16 0
Attendance—estimated at one hour per day, at 4d. per hour	5 4 0
Making total of working expenses	£28 12 6
The first cost of engine and cistern complete was £170, and the annual tear and wear may be taken at the rate of 7½ per cent., or	£11 18 0
Depreciation, the same	11 18 0
Making together	£23 16 0
Add to this working expenses as above	28 12 6
The total charge for year will be	£52 8 6

The amount of the working expenses would necessarily vary with the varying price of gas in different localities. What is given above was the selling price in Edinburgh and Leith last year; but, of course, the actual expense, where it is used in a gas-works, will be not the selling, but the cost price of the gas.

With regard to the percentages charged for tear and wear and depreciation, these are, I am sure, ample, looking to the well-finished and substantial style in which these engines are got up, the absence of complicated working parts, and the large bearing surfaces of the parts liable to be worn out.

The amount of power derived from the above expenditure has been on the average at least 2-horse power. As explained before, the use of several of the machines is intermittent, but it takes about 1½-horse power to drive those that are constantly in use, and the addition of ½-horse power to the average for those that are used occasionally (including, as they do, a circular saw of large size, and a heavy screw-cutting lathe) is a very moderate estimate. This works out to an expenditure of about 17 cubic feet of gas per indicated horse-power per hour, which is much below what is stated to be used when the engine is worked with a full load, and seems to bear out what was stated by Mr. Carr in his paper last year, that, contrary to what might be expected at first sight, the engine works more economically when not used up to its full power.

The cost of a steam-engine and boiler of 3½ nominal horse-power, and equal in respect of workmanship to the "Otto" gas-engine, would be about £110, and the usual allowance for tear and wear and for depreciation would be 10 per cent. per annum for each on an engine and boiler of this size. This relatively to 7½ per cent. for the gas-engine is not at all excessive, as, of course, the boiler involves more tear and wear. The working expenses would be as follows:—

For fuel, at 8s. per week for 52 weeks	£20 16 0
Wages of attendant, at 12s. per week	31 4 0
Oil for lubrication—same as gas-engine	2 16 0
Water supply for boiler	2 10 0
Making total working expenses	£57 6 0
Add for wear and tear, 10 per cent. on cost	11 0 0
And depreciation, the same	11 0 0
Making total charge for year	£79 6 0

It will be borne in mind that the cost of fuel will be more or less than what is given above according to locality, but it is a fair estimate, checked by actual experience of the working of a small steam-engine and boiler in our works, and by comparison with what it costs various users of similar engines in the neighbourhood. The wages of an attendant I have taken at 18s. a week, and I have allowed 6s. off that, on the supposition (which in many cases, however, could not be realized) that the man would devote so much of his time to other work.

The general results, then, are as follows:—

Working expenses of gas-engine	£28 12 6
Ditto of steam-engine	57 6 0

And taking tear and wear and depreciation into account, the total annual charge would be—

For gas-engine	£52 8 6
For steam-engine	79 6 0
	£26 17 6

The advantage is therefore largely in favour of the gas-engine, and I venture to think that if I have erred at all in the comparison, it is in under, not over estimating the cost of the steam-engine. I have also to point out that our engine is constantly going during working hours. There are, however, an infinite number of cases where power is needed only at intervals, and in such cases the comparison would be still more in favour of the gas-engine.

In all cases where we have supplied gas for these engines, the testimony of the users has been highly in their favour, and, not long ago, one gentleman gave me his experience as being that, when he had a steam-engine, it cost him 18s. a week for wages to the attendant, and from 10s. to 12s. a week for fuel, but that now his cost was from 4s. to 5s. a week for gas, and no attendant needed.

In addition to the saving in cost, however, the gas-engine has other advantages: It occupies small space; is always ready at a moment's notice; does away with the risk and danger of explosion, thereby reducing cost of insurance, and allowing insurance to be effected in places where, with a steam-engine and boiler, the companies would not undertake it; it also needs no special building, or chimney, and does not make the premises, where it is used, uncomfortable with heat, dust, and cinders. One drawback it has, not as regards those who use it, but as giving trouble occasionally to gas managers—namely, that the action of the engine causes an oscillation of the lights taken from services immediately adjoining that of the engine, when the main pipe is small, say under 4 inches diameter. The supply should, therefore, be always taken from a large main where practicable, or at any rate no other service should be taken from the main (when it is less than 4 inches diameter) in close proximity to that for the engine. I may also note that the pressure of gas in the main must be at least equal to that of 7-10ths of an inch of water.

That gas-engines will ere very long come into extensive use, I think certain; not only as supplanters to some extent of steam-engines, but also as affording a cheap and efficient motive power in a great number of places where the use of steam is difficult or impossible. It is obviously the interest of gas companies and gas managers to forward their employment as much as possible, because they not only increase consumption of gas, but, by using it chiefly during the hours of daylight, no corresponding increase of capital expenditure is involved; and their extensive use would not only benefit gas companies, but gas consumers in general, by reducing the cost of manufacturing the gas.

Discussion.

Mr. Whimster said he erected a gas-engine at the end of an entry in Perth, and as there were several service-pipes in the locality, the supply was taken from one of these; but to his chagrin, when it commenced to work, complaints came in from all directions. Various schemes were tried to remove the ground of complaint, but ultimately he was compelled to put in a service-pipe specially for the engine.

Mr. Smith said there were a good many gas-engines in Aberdeen in connection with lifts, and he never heard a single complaint about one of them.

Mr. Whimster said the principal complainer was a man whose house was rather dark, so that he had to use a good deal of gas during the daytime.

Mr. Dalziel said he put in a 3-horse power gas-engine at Kilmarnock, and the place to which it belonged had twenty lights, independent of the service to the engine; but he never heard a complaint about the engine. They gave about 7-10ths pressure during the day.

Mr. Mitchell said that with one engine in Dundee, when the service-pipe pressure from the main did not exceed 16-10ths the oscillation was great, and they therefore had to put in a separate service for the engine. In another case of a 16-horse power "Otto" engine which had been placed in a large warehouse at the dock for lifting purposes, it was found on connecting the 3-inch service to the engine that they were unable to give anything like a proper supply of gas. They in this case had to lay a 3-inch pipe from a 14-inch main inside the works before the gas passed through the governor, in order to give 3 inches pressure for the engine. Although it was possible to supply enough gas for the working of the engine by this arangement, a separate service had to be laid to the place for the ordinary lights on account of the oscillation caused by the working of the engine.

Mr. McGilchrist thought that what had been stated did not in any way tend to encourage the use of gas-engines, at all events if they required 3 inches of pressure and special services laid, in the way that had been indicated.

Mr. Mitchell said the parties he mentioned paid the whole expense of the services. Besides, if the large engine had been situated farther up the town there would not have been any necessity to lay a separate service—they could have given, say, 18-10ths of pressure from the works, and so would not have required to lay an independent supply-pipe.

Mr. MacPherson: Where, then, was the necessity of giving 3 inches of pressure?

Mr. Mitchell said there was no other way of getting the thing done, because the ordinary means had failed, and they had no alternative but to give the gas before it passed through the station governor.

Mr. Whimster asked if they paid any attention to the fittings of the pipes in connection with the 16-horse power engine—whether they were (as sent by the maker) amply sufficient to provide a 3-inch supply, or were they so small that they would require more than 16-10ths of pressure to force the gas through? He did not see, if a 3½-horse power gas-engine could be supplied from an ordinary main with 16-10ths of pressure, why a 20-horse power engine could not be supplied if the pipes were of sufficient size.

Mr. Mitchell said in practice it was clearly brought out—whether it was the pressure, or the sucking power of the piston—that oscillation at a distance of 200 or 300 yards was experienced. He could not give the size of the pipes from the meter to the engine, but the connections at the engine were as large as those at the meters.

Mr. Whimster said he found the connections of the engines were made very small.

Mr. Smith asked what quantity of gas was used per hour.

Mr. Mitchell: About 300 cubic feet.

Mr. MacPherson was inclined to think the whole difficulty was in the connections. A pressure of 16-10ths was sufficient if there was the size of pipe sufficient to convey the amount of gas needed.

Mr. Smith thought the makers of gas-engines ought to remember that

gas managers did not work with more than ¼-inch of pressure during the day.

Mr. TERRACE said he was pleased that the paper of Mr. Linton had led to such a useful discussion. He explained that in Edinburgh a rule was made that there must be 40 feet of pipe between the meter and a gas-engine. In a particular case that he knew of, the engine—which was an old vertical ½-horse power engine—had a meter quite separate from the meter through which the gas consumed in the office passed; but the same service from the main supplied both meters. This engine cost ½d. per hour for gas, and required to be cleaned once a week when in constant use. In consequence of the arrangement to which he had referred there was not the slightest oscillation. He was very much of Mr. MacPherson's opinion as to the supply for a gas-engine, that it was a mere question as to the size of the main, and not one of pressure or distance. The size of the main must be commensurate both with the distance and the pressure. He thought that the need for 3 inches of pressure might be obviated by increasing the size of the service. In Arbroath there were three of the "Bisschop" engines at work, and although they only gave 7-10ths of day pressure no difficulty had ever been experienced. If there were any oscillation the lights would be affected in the printing-office where one of the engines was used.

A vote of thanks to Mr. Linton for his paper was then passed.

(*To be continued.*)

SOME NOTES FROM AMERICA.

(FROM OUR OWN CORRESPONDENT.)

The Engineer of the Cleveland Gaslight and Coke Company (Mr G. H. Hyde) has recently made some experiments relative to the candle power of the electric light, to which I will briefly refer. The light experimented on was a Brush lamp, rated at 2000 candles. A Bunsen photometer was used; the photometer-room, with blackened walls, being built expressly for the purpose. The electric light in a plain glass globe was compared directly with a test candle; and 80 observations were taken, the observed candle power of the light ranging from 607 to 176, while the average corrected power was only 383 candles. Mr. Hyde informs me that he used the utmost care in the conduct of the experiments. If these tests be accepted as conclusive, it is certainly another proof of the excessive power attributed to the electric light. It may be open to doubt whether such a trial as this, wherein there is such a great difference between the light experimented on and the standard used, is absolutely correct, but it certainly cannot be far out of the way.

At Montreal the Harbour Commissioners are making a trial of the electric light for illuminating the wharves, and thus facilitate the loading and unloading of vessels at night; the light giving great satisfaction. A prominent stevedore of the city says of it, that the men can work as rapidly and as safely by its aid during the night as through the day. The number of lamps put up so far is 16. One Brush generator, of large size, produces the electricity, while the length of the circuit is between 11,000 and 12,000 feet—probably the longest circuit in this country. The cost of running the 16 lamps, including wear and tear and interest on the investment, is said to be 8 cents (4d.) per hour per lamp. If the City Authorities decide upon adopting this means of illuminating the wharves, the system will be extended by the addition of 32 more lights, and the single burners now used will be changed for double ones working automatically, by which means the light may be continued for 16 hours at a stretch. If the cost of the light—8 cents per lamp per hour—be correct, it is certainly very little; I think, however, that it will eventually be found that this figure is too low.

Another novel experiment in electric lighting is shortly to be made. This time the scene is to be laid in Holyoke, a town in Massachusetts. Professor Spaulding, of Boston, is to erect a tower 175 feet high, and place thereon an electric light of 300,000 candle power, and he expects to so flood with light the part of the town adjacent to the tower, that other lights will be unnecessary either indoors or out. This one light he will put up at his own expense, and expects to make such a success of it as will warrant the Town Authorities erecting six more, which he claims will be sufficient to illuminate the entire town. The idea is to fill the stratum of air above the city with light of such intensity as to permeate all space, and convert night into day. I fear the professor will be a poorer man before he has finished his experiment.

It now appears that the only obstacle to the complete success of Edison's light has been the impossibility of procuring a sufficiently steady engine. Now, however, a 100-horse power engine is being built in Philadelphia for the inventor, which is to be capable of making 600 revolutions a minute. When this engine is put in operation the troubles of Menlo Park are to cease.

A charter has been granted to a Company in Philadelphia to manufacture and sell electricity for illuminating purposes, and to make the necessary lamps, &c. As the capital of the Company is to be only 50,000 dols. (£10,000), they cannot have very extensive aims.

The Holland Hydrocarbon Retort is a name given to a recent invention by which it is proposed to furnish heat, light, and power. The retort is made in different sizes, according to the work required of it; the smallest ones being about 8 inches long, 6 inches high, and 6 inches wide. A partition separates the retort, which may be placed in the fire-box of a cooking-stove, one section being connected with a naphtha tank, the other with the supply of water. The first, or initial heat, is obtained by lighting a small quantity of naphtha in a cup under the retort, by which means gas and steam are generated. These burning together under the retort are supposed to supply the heat for the continued generation of the gas and steam, and also, where desired, furnish heat for cooking, &c. When it is required to make gas for lighting purposes, a retort with an additional chamber is needed, and the outlet-pipe for the gas is led back and forth against the retort, in order to make it a "fixed gas." A dry scrubber and a holder complete the apparatus. I have given you a brief account of this invention, not that I think it will ever at all militate against the interests of gas companies—for few householders would be willing to introduce naphtha into their kitchens—but in order to give to your readers a true account of its workings, as some papers are inclined to puff it considerably. It is also proposed to use the retort to generate steam on locomotives, and the patentee claims that he will be able to run them at from 3 to 4 cents. (1½d. to 2d.) per mile, which would be a great saving over the present expense, which is about 10 cents. (5d.).

As the subject of heating retorts by means of regenerative furnaces is claiming a good deal of attention at present, especially on your side of the water, it may be of interest to note what is being done by way of an experiment at the Metropolitan Gas-Works of New York. To test the matter, two benches were fitted with Liegel's furnaces, but as they are not separated from the other benches, the result cannot be given in figures, but the Engineer of the works informs me that there is considerable saving of fuel, a greater simplicity of working, and much less labour required in attending to the fires; no clinkering or barring out being necessary, as the clinker runs off as a flux through the slit. This reduces the labour to a minimum, the fireman having only to feed the furnace with fuel, and keep the slit clear, which is an easy task, it only being necessary to run the rake through it every few hours. Another feature in favour of this system of heating benches is that the ashes and dirt do not make their way into the flues and obstruct them. As a practical proof of the satisfaction these furnaces have given this Company, I would mention that they are just now constructing 20 more. I hope to be able to lay before your readers at a future time some data as to the result of their working.

There does not seem to be much doubt of the success of the regenerative furnaces applied in large works, for all the trials so far have shown a decided saving from their use; but the question as to the practicability of their adoption in small works is one yet to be determined. Thanks to the pluck of the Superintendent of a small gas-works in Connecticut, the problem is in a fair way to be solved. At the works referred to, where the average make is about 25,000 feet a day, one of Dieterich's furnaces has been built, and will probably be fixed during the coming fall. This trial is one of more than ordinary importance, as the number of small works is so great, that if the regenerative furnace is found to be a success in this instance, there are hundreds of works where it may be applied with reasonable hope of its being a lucrative investment. In small works, as a general rule, a less number of retorts are set to a bench than in large works, so we would naturally expect the saving in the former to be less than in the latter.

Yonkers is a town of about 20,000 inhabitants situated on the Hudson River a few miles from New York. The gas supply of the town is certainly getting in a very confused state, having the doubtful blessing of two Gas Companies, which have been indulging in the expensive business of trying to ruin each other. So determined was the rivalry between the Companies, that they sold their gas for a mere nothing. Eventually seeing they were mutually ruining one another, they effected a compromise, divided the town into two sections, and each Company kept to its own district. On the 1st of May the Westchester Company, which is the newer concern, notified the Yonkers Company that they wished to discontinue the agreement formerly entered into; at the same time accusing their rival of stealing gas from their mains, for which the Westchester Company have sued their opponents, claiming 1000 dols. damages. Thus chaos reigns again, and the condition of affairs will not be improved when the works which are being built by a Company to supply Strong's heating gas are put in operation. This latter Company expects to supply gas for heating purposes at from 50 to 75 cents (2s. to 3s.) per 1000 feet.

Gas affairs might be somewhat complicated if the formation of companies for supplying heating gas were to become general. If the price of coal gas can be reduced, however, there will be little to fear in this direction. Improvements, so called, in the process of gas making should be thoroughly examined and the fact determined, whether they are improvements in truth or only in name. At the present average price of gas, say 2 dols. 25 cents. (9s.), Strong's gas at 75 cents. (3s.) is cheaper for cooking purposes; but if coal gas can be reduced somewhat, there is little doubt but that gas companies mains will in a few years hence be kept almost as busy in the daytime as at night; for the heating effect of Strong's gas is 8798 units, while that of coal gas is 22,000 units, making the latter gas about two-and-a-half times more valuable as a heating agent. It is claimed for the Strong gas, as now made, that it has an odour, but the pure Strong gas is certainly odourless, and, therefore, its adoption in dwellings might be attended with some very serious consequences.

A fire occurred at the Coney Island Gas-Works on July 30, but it was not of a very serious nature. Some barrels of tar took fire, making a very dense smoke, and thus creating a good deal of alarm, but doing comparatively little damage.

The private gas-works at Bergen Point, New Jersey, built to supply the large hotel at that place were entirely destroyed by explosion and fire on Tuesday, the 3rd. inst. The gas-house was a brick building, about 15 ft. by 20 ft., containing the apparatus for making oil gas, and a holder 8 ft. in diameter and 10 ft. high. It seems the holder was filled, and gas was still allowed to generate. This, escaping from underneath the holder, soon filled the building with an explosive mixture; while the only other thing wanting, a fire, was burning under the retorts. The roof was thus very soon blown off, and the entire works destroyed. Gas men will quickly draw two morals from the occurrence: Not to place a gasholder and a fire in the same building; and always to have a competent man to oversee the gas-making.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

The price of gas has been reduced by the Forres Gaslight Company 5d. —from 7s. 6d. to 7s. 1d. per 1000 cubic feet.

On Thursday last the Shareholders of the Penicuik and District Gas Company, Limited, held their fourth annual general meeting—Mr. James Birrell, of Uttershill, presiding—when the Secretary, Mr. Thomas F. Weir, S.S.C., Edinburgh, submitted the report of the Directors for the year ending July 1, 1880. It stated that the price at which gas was supplied during the year was 5s. 10d. per 1000 feet, and that the Directors proposed to divide among the Shareholders a free dividend of 6 per cent. on the amount of paid-up stock, which would absorb £360, and that the balance of revenue would be carried forward as a fund for depreciation and extension of works. The report was unanimously approved of, and Messrs. Henderson and Russell were re-elected Directors, and Mr. Brown Auditor.

The Forfar Corporation Gas Committee now have their new gasholder finished and into position, its height being 36 feet, in two lifts, and borne by eight columns 38 feet high. The erection was pushed on so as to get the work completed before the winter should set in, and all is in readiness for the gas being turned on, if the Manager (Mr. Esplin) could only get water to fill the tank; but the summer has been so dry that, pending the completion of the new water-works, the existing town supply will not admit of the necessary quantity being had from that source.

At the annual meeting of the Stewarton Gaslight Company, which was held some days ago—Mr. James Love presiding,—a dividend of £1 was declared on the original £5 shares, and the balance of profit was carried to the rest fund. The vacancies in the directorate were filled up, and the Collector and Treasurer were appointed *pro tem.* The meeting, which was thinly attended, broke up rather abruptly, without passing the usual votes. There was some talk of reducing the price of gas 5d. per 1000 feet.

On Thursday afternoon, in the County Hotel, Paisley, Mr. James R. Macfadyen exposed for sale thirty shares of the Paisley Water Company, and shares to the amount of £200 of the gas annuities. The thirty water shares were exposed at the upset price of £16 per share, and realized £16 13s. each. The two £100 gas annuities were exposed at £155 each, and one of them realized £158 10s., the other being purchased at £159.

Business was done last Thursday in the Edinburgh Gas Company's stock at £47, and on the preceding day in the Edinburgh Water annuities at £154.

In consequence of the anticipated running short of the Ayr water supply, the Water Commissioners fully a fortnight ago found it necessary to cut off the supply for six hours during every night. As the water in

the reservoirs still continues to diminish, it was found expedient last week to issue notices intimating a still further curtailment of the supply sent into the town, and no water will, until further notice, be obtainable between the hours of 8 p.m. and 6 a.m. Should the present drought continue a very serious diminution of the water supply will have to be met, and in view of this the Magistrates have issued an urgent appeal to the inhabitants not to waste the water. This unfortunate state of matters is the consequence of the accident to the new reservoir, which, had it been ready at the time intended, would have supplemented the present supply by 20 million gallons.

At the last monthly meeting of the Greenock Water Trust, the Superintendent submitted his statement of water in store, from which it was found to amount to 268,422,523 cubic feet, being equal to a supply for 76 days for all purposes. At the same meeting the rate of assessment for the ensuing year was fixed at 8d. per £1 of rental for domestic purposes; 1½d. per £1 for public water-rate; and the rate for extended boundary for water used for domestic purposes, 1s. per £1, with 10 per cent. added for water used for other than domestic purposes. The expenditure was estimated at £23,125, and the income at £23,371 14s., including last year's surplus of £227 14s.

An inspection of the new water-works at Wormit for Newport-on-Tay was recently made by the Dundee Water Commissioners, when it was found that they were in every way satisfactory.

Cupar Water-Works were recently inspected by the Police Commissioners of the burgh, who indulged generally in congratulations on the satisfactory condition of the works. Since then they have sat as Water Commissioners to fix the assessments for the ensuing year. The rate payable by owners and occupiers was in each case increased by 1d. per £1 of rental—the charge being 6d. per £1 and 11d. per £1 respectively; and the domestic rate was fixed at 1s. 5d. per £1 of rental.

When the Burntisland Water-Works were officially inspected on Wednesday week, there was found to be in store equal to a supply of 115 days, notwithstanding the dry weather, and allowing the extreme output of 250,000 gallons per day to the town, and a similar quantity of compensation water.

There was a severe drop in prices last week in the Glasgow pig-iron market, and a very large amount of business was done. The highest price was 55s. 6d., which was paid on Monday, and the lowest was 53s. cash, paid on Friday afternoon.

No material change has taken place in reference to the miners strike. Prices of coals are firmer, and in some cases advanced.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The coal trade of this district continues extremely dull, and colliery proprietors are working through what is usually considered one of the worst months of the year, house-fire coals being in little or no demand, whilst the numerous "wakes" and other holidays throughout the district interfere considerably with the requirements for manufacturing classes of fuel. The pits, as a rule, are still only working about half time, and sales of all classes of round coal are pressed at excessively low figures.

In the gas coal trade there are now very few inquiries for anything like quantities, most of the important contracts in the district having been either already settled or the tenders have been all sent in. Where, however, any inquiries have been quoted for it is at very low figures, and the average prices at the pit's mouth may be given at about 6s. to 6s. 6d. per ton for best screened gas coal, and 4s. 9d. to 5s. 3d. for inferior sorts, such as Wigan four-feet mines. Good ordinary cannel is being offered at the pit's mouth at from 12s. 6d to 14s. 6d. per ton, although for the best Wigan cannels considerably higher prices are asked.

The better qualities of slack are rather scarce and firm in price, but there is an abundance of the inferior sorts in the market, and burgy is also tolerably plentiful. Good slack fetches about 3s. 6d. per ton at the pit, and good ordinary burgy about 4s.; but common sorts are to be bought at 6d. to 1s. per ton under this.

Shipping continues very dull. A fair quantity of coal is being disposed of for steamers use locally, and a few cargoes are going away to Ireland and to Russia; but in the ordinary shipping trade there is very little doing, and extremely low prices are still taken.

Coke remains in very poor demand. The average quoted prices at the ovens are about 9s. to 12s. per ton, according to quality, but best Lancashire worked cokes are being sold at as low as 11s. per ton at the ovens.

There has been very little doing in the iron trade during the past week, but neither in the local nor the district brands at present coming into this market are any lower prices being taken. Lancashire pig iron delivered into the Manchester district is still quoted at about 50s., less 2½; Lincolnshire and Derbyshire, 50s. to 51s., less 2½; Lancashire bars delivered equal to Manchester, about £6 5s. to £6 10s. per ton. Local makers are generally tolerably busy.

THE COAL AND GENERAL TRADES OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The more active shipping business always noted in connection with the gas coal trade of the Tyne in the last week in August has commenced. The coasting trade had been dull for months. Last week a demand sprang up for small sailing ships to load gas coals for the coast. Several were engaged, while more are inquired after; and it may be expected that September will show considerable results in the shipments of gas coals not only to the southern ports, but to the Baltic. The rate of freight is not affected so far. Even last week, when there was a scarcity of handy sailing tonnage on the Tyne and Wear, there was not a rise of more than 3d. per ton of freight, and that was very temporary; for, after immediate requirements were met, they fell back to their old condition. At the present moment merchants and colliery offices are rather anxious to have sailing ships at their command in the gas trade. Where possible steamers are employed in carrying timber and other produce from the Baltic to the United Kingdom. At the same time there is plenty for coasting purposes, and rates thence are very little changed. Whilst there is undoubtedly more business transacted at the collieries, there is little, if any, alteration in the price of gas coals. It is not likely to occur. Steam and house coals are in moderate demand. There is a little more inquiry for manufacturing coals for shipment, as is usual at this time of the year.

The demand for coke is maintained. The price of a medium quality of this description of fuel is from 11s. to 12s. per ton delivered at the iron-works on the Tees. Both in coals and coke there are, of course, favoured collieries, which have specialities, and command a market; but in relation to the general trade, comprehending all classes of coals, prices are not strong. Under circumstances such as these, it is found impossible for any one single branch of the trade to limit supply and force prices up. It is very probable, therefore, that rates in the gas coal trade will remain pretty much as they have been over the year.

The iron trade of the North of England is affected by fluctuations at the present time. There is a falling-off of demand in the finished iron trade, but it is hoped a better business will be done in September. Iron-founders are badly off for work as a rule. Prospects are only moderate. The shipments of second-class fire-bricks have fallen away, and the lesser manufacturers, who have been adding to stock lately, are somewhat keen after business, and have been selling rather low; but the first-class establishments, which have had contracts running over the shipping year, are doing very well, as their production is pretty well anticipated for export.

The chemical trade of the North of England, notwithstanding the fact that stocks are generally low at the factories, is very dull. There is a singular lack of orders from the Continent for the season. This circumstance is explained through operators, who bought up chemicals in the early part of the year, having forced their purchases into the market, sold cheaply, and overstocked the trade abroad. Lead and other metals are not materially changed in value; but resent advances in price on this side, have attracted a larger supply of Spanish and German lead into the market.

THE YORKSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The iron trade of Yorkshire continues in a somewhat depressed state, particularly in light castings suitable for colliery and building work. In the heavier branches there is rather more doing, castings such as gas and water-pipes, and similar apparatus, being in fair request. The make of pig iron has of late shown no falling off, but the output is larger than the demand. Engineering firms are only badly off for orders; but makers of Bessemer steel rails, tyers, &c., are kept fairly going on account of home and foreign orders.

As is usual at this season of the year there is a fair demand for steam coal, chiefly for exportation to the Baltic and other ports. The tonnage to Hull and Goole from the West Yorkshire pits is fairly sustained, whilst some collieries are sending largely to Hull. A very good tonnage is also being forwarded to Grimsby, some of the merchants at that port being partners in South Yorkshire collieries. A good deal of what is sent is supplied per contract at low rates, and where sales are negotiated by private arrangement coal owners are unable to get much higher rates. Hard coal for smelting purposes is not in such good request as was the case a short time ago.

A fair tonnage of gas coal is being sent from several of the collieries in South Yorkshire to the Midland counties, but, as might be expected, the consumption is curtailed by the quiet state of trade. More of the Silkstone coal is likely to be used for gas-making purposes than has been the case for some time, owing to the low figure at which it can be obtained.

The coke trade is much quieter than it was, and prices are consequently easier. The demand for North Lincolnshire has decreased with the blowing out of some of the blast furnaces.

At several large collieries the men have been asked to submit to reductions in wages amounting to about 5 per cent., whilst at others 700 men and boys are under notice, the owners declaring their intention of closing the pits until a more profitable season comes round. It is, however, hoped that some terms may be come to which will enable them to continue working.

THE SOUTH STAFFORDSHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

A slight increase has been apparent in the demand for coals of several qualities during the past week; chiefly, however, in respect to household sorts, for which there is to be noticed a stronger market than has been experienced for several months at least. The demand for gas coal is fairly maintained, and with the advent of the autumn months an increased output is looked for. The bulk of the inquiries in the markets are reported to be of an improved class, and masters are looking forward to the next few weeks as likely to be productive of a change for the better. The call for rough slack, and fuel for smelting purposes, continues to be one of the most active features of the trade.

The failure of the recent memorial from the Tipton district, asking for exemption from the operation of the Mines Clauses Act, was announced a few days ago. This result, which is owing to the memorial not having been signed by the statutory majority, as required by the Act to make it valid, is looked upon with a great degree of satisfaction by a large number of the colliery proprietors and ironmasters of this district, and who, had it been successful, would thereby have been greatly affected.

The pig iron trade is reported to be steadily improving, and the markets are firm. Though no addition to the number of furnaces in blast has been noted during the past two or three weeks, yet a brisk run on those in operation continues. At last week's markets a fair trade was done, and some good contracts changed hands. In the finished iron department inquiries for bars at £8 per ton are numerous, though the unmarked brands have perhaps the greatest call. The majority of the transactions were for qualities averaging from £6 10s. to £6 15s. per ton. Galvanized sheets, strip iron, hoops, and common sheets were firm at last week's quotations, and a steady trade was done, the call perhaps being for galvanized sheets, which are in good request for the foreign market. The export trade is less brisk, and but few orders have arrived during the past week or nine days. Coke is a little dearer.

THE SALFORD CORPORATION AND THE PRICE OF GAS IN THE OUT-DISTRICTS.—At the last meeting of the Barton Rural Sanitary Authority, the Clerk read a letter from the Town Clerk of Salford, stating that the Gas Committee were prepared to recommend for adoption by the Corporation a reduction of 3d. per 1000 cubic feet in the price of gas supplied to consumers within 5 miles of the boundaries of the borough, such reduction to date from the 1st of July.

THE FORTHCOMING EXHIBITION OF GAS APPARATUS AT EXETER.—We understand that it is the intention of the Exeter Gaslight and Coke Company to offer four silver medals at the meeting of the Sanitary Institute, to be held in Exeter from Sept. 21 to Oct. 9 inclusive. The medals will be for the following:—One for the best gas stove or apparatus for cooking purposes for families, including a sufficient supply of hot water. One for the best gas stove for an artisan's family of from four to eight persons. One for the best and most economical open gas fire. And one for the best heating arrangement for general domestic purposes, including the best method of heating baths.

PRESENTATION OF A TESTIMONIAL TO MR. T. ANDERSON, OF BATH.—On Monday evening last week Mr. T. Anderson, who for 18 years has been Manager of the Bath Gas-Works, was presented by the foremen and labouring staff with a testimonial, consisting of his portrait, at the base of which was a silver plate bearing the inscription:—"Presented by the workmen of the Bath Gas-Works to the late Manager, Mr. T. Anderson, as a token of their respect." The presentation was made by Mr. Head, one of the foremen, and senior workman. Mr. Anderson returned thanks in a few appropriate words, and observed that during the 18 years he had had charge of the works he had endeavoured to do his duty to the Company. He thanked the men for their most kindly present. Speaking of the presentation, one of the local papers says: "In thus closing his connection

with the works, it is but fair to say of Mr. Anderson that he has performed an arduous and difficult task with firmness and good judgment. People are not long in grumbling if their gas be deficient, but throughout his long *régime* Mr. Anderson has achieved the success his energy and sound practical knowledge entitled him to."

Extension of the New York Water-Works System.—According to the *Scientific American*, the work soon to be undertaken for the enlargement of the system of water supply for New York City includes the construction of a 15-feet dam at the outlet of the Little Rye pond, connecting both Big and Little Rye ponds, and forming a lake of 280 acres in extent, capable of storing 1050 million gallons. It is also proposed to build a dam on the Bronx, near Kensico, 45 feet high, making a reservoir of 250 acres, having a capacity of 1620 million gallons. A dam will be built across the Byram river 15 feet high, creating a lake with a capacity of 180 million gallons. The Byram and the Bronx Rivers it is proposed to unite at this point. From the Kensico dam the water will be conducted through a 4-feet iron pipe along the valley of the Bronx to a reservoir near William's Bridge in the upper part of the Twenty-fourth Ward, the elevation of which is 180 feet above tide-water and 65 feet above the Croton Aqueduct, and the capacity 100 million gallons. The length of this conduit is 15 miles. The Kensico reservoir will give the city of New York from 18 to 20 million gallons more water daily. It is estimated that the work will be finished in about two years, and cost about 2,700,000 dols. By tapping the Bronx at Kensico there will be obtained not only pure water, but a remarkably good head. The country drained—over 13 square miles—is similar in geological character to the Croton Valley.

The Costs Incurred in Obtaining the Birmingham Gas (Northfield and Yardley) Act, 1879.—On Wednesday, the 18th inst., Mr. Harrison, one of the Inspectors of the Local Government Board, held an inquiry at Birmingham relative to the apportionment, between the parishes of Northfield and Yardley, of the costs incurred in obtaining the above-named Act last year, by which it was provided, it may be remembered, that the Northfield and Yardley districts should be supplied with gas by the Birmingham Corporation at a lower price by 1s. only per 1000 feet than the Corporation Act provided for the borough. After some conversation the Inspector expressed his opinion that the apportionment of the expenses should be in accordance with the proportion of advantage that would be obtained by the respective parishes from the passing of the Act, and this was to be ascertained by the amount of gas consumed in each district. The figures submitted to him showed that in 1877 the amount of gas consumed in Yardley parish was 12,910,400 feet, in Northfield district 8,709,800 feet; in 1878, Yardley 15,688,700 feet, Northfield 10,389,400 feet; and in 1879, Yardley 17,453,900 feet, Northfield 11,025,100 feet. This gave as the advantage derived from the Act £872 13s. to Yardley, and £550 5s. to Northfield, or a total of £1423 in one year; so that in a little more than two years the two parishes will derive as much benefit as will pay their expenses. Both the Clerks to the Local Authorities assented to the expenses being apportioned on the basis suggested by the Inspector, who said he would report to the Local Government Board.

APPLICATIONS FOR LETTERS PATENT.

3303.—Sambidge, H. W., Birmingham, "Improvements in shades for gas and other lamps, and in the galleries for supporting the same." Aug. 18, 1880.

3307.—Mallock, H. R. A., Brampford Speke, Devon, "A new or improved apparatus for indicating the level of water or other liquid." Aug. 14, 1880.

3340.—Wischin, G., Prague, Austria, "Improvements in and appertaining to the distillation of valuable products, more especially anthracene, from coal tar or coal tar pitch." Aug. 17, 1880.

3364.—Aube, P., Paris, "Improved processes for manufacturing steel and lighting gas." Aug. 19, 1880.

3374.—Siemens, C. W., Westminster, "Improvements in gas-producers and furnaces operating in connection therewith." Aug. 19, 1880.

3382.—Willoughby, J., Plymouth, Devon, "Improvements in the construction of ball and other valves or cocks for regulating and controlling the supply of water and other liquids." Aug. 20, 1880.

3406.—Sweet, A., St. Pancras, London, "Improvements in valves known as of the screw-down kind." Aug. 23, 1880.

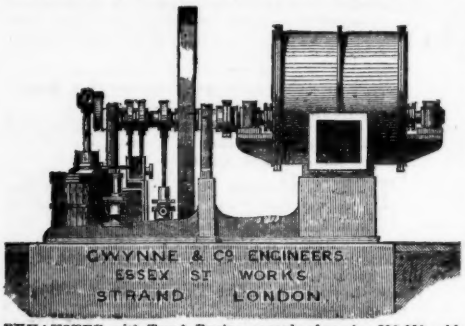
3428.—Day, J. J., Kentish Town, London, "Improvements in water-closet and other valves, and apparatus for cleansing, controlling, regulating, supplying, and withdrawing of water and other liquids, and preventing waste and overflow." Aug. 24, 1880.

3436.—Lake, W. R., Southampton Buildings, London, "Improvements in fluid-meters." A communication. (Complete specification.) Aug. 24, 1880.

3464.—Coglievina, D., Vienna, "A centigrade photometer." Aug. 26, 1880.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

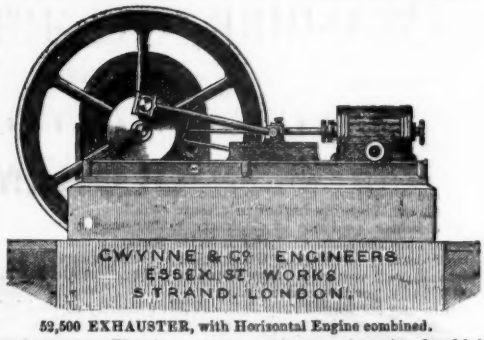
GWYNNE & BEALE'S PATENT GAS-EXHAUSTERS & ENGINES.



EXHAUSTER with Trunk Engine, capable of passing 210,000 cubic feet per hour.

The Judges report on the combined Exhauster and Steam-Engine exhibited at the Philadelphia Exhibition is—*"Reliable compact Machine, well adapted for the purpose intended, of excellent workmanship."*

GWYNNE & CO. have made the largest and most perfect Gas-Exhausting Machinery in the world, and have completed Exhausters to the extent of 8,000,000 cubic feet passed per hour, of all sizes from 2000 to 210,000 cubic feet per hour.



52,500 EXHAUSTER, with Horizontal Engine combined.

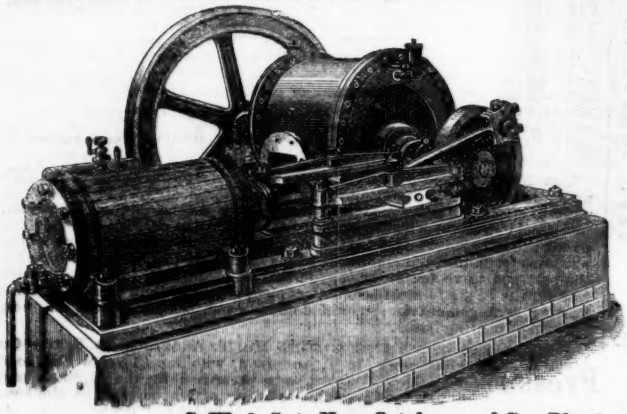
GWYNNE & CO. do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, *but to produce machinery of the very highest quality, and most approved design and workmanship.* The result is that in every instance their work is giving the fullest satisfaction. Numerous testimonials and references can be given to Companies using their Machinery for years past.

Exhausters, with or without Engines combined, can be made to pass the gas WITHOUT OSCILLATION OR VARIATION IN PRESSURE Regulators, Bye-Passes, Stop-Valves, Gas-Valves, Station Governors, and Gas Machinery of all Sizes.

PLEASE ADDRESS IN FULL, GWYNNE & CO., Hydraulic and Gas Engineers, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C., ENGLAND.

Gwynne & Co.'s New Catalogue on Gas-Exhausting and other Machinery may be obtained on application at the above Address.

BEALE'S IMPROVED PATENT GAS EXHAUSTERS,



WITH

Wrought-Iron Spindles and

ENGINES COMBINED.

SOLE MAKERS,

GEORGE WALLER & CO.

MAKERS OF ENGINES, EXHAUSTERS, INDEX AND DISC GAS-VALVES, HYDRAULIC MAIN VALVES, BYE-PASS VALVES, TAR, LIQUOR, AND OTHER PUMPS, SCRUBBERS AND PURIFIERS, CONDENSERS, BOILERS, &c.

G. W. & Co.'s New Catalogue of Gas Plant and Machinery can be had on application.

[*SEE ALSO ADVERTISEMENT, PAGE* 358.]

Phœnix Engineering Works:

HOLLAND STREET, SOUTHWARK, S.E.

WANTED, Readers of the NEW Edition, "Cooking & Heating by Gas;" on Burners, &c. Copies, by post, Threepence, direct from the Author, MAGNUS OHREN, Assoc.M.I.C.E., Gas-Works, SYDENHAM.

ADVERTISER, who will be disengaged in September, will be open for Engagement as MANAGER in Chemical Works, Tar, Ammonia, &c. Has a knowledge of Chemistry. Good references. Address M 30, at C. H. MAY AND CO.'s General Advertising Offices, 78, Gracechurch Street, LONDON.

ADVERTISER, aged 30, with experience as RETORT-SETTER, wants Situation in Gas-Works. Can do Mason work in all its branches. At present in Leith Gas-Works. Good references from present and former employers. Address W. SWAN, 56, Bridge Street, North Leith, SCOTLAND.

WANTED.—The Advertiser, a Young Man, aged 39, married, is open for an Engagement as MANAGER and SECRETARY of a medium-sized Gas-Works, or SUB-MANAGER of a large Works. Has a thorough Knowledge of the Manufacture and Distribution of Gas in all its branches, having had sole management of Gas-Works for 16 years. Highest testimonials and references. Address No. 678, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WATER-WORKS Manager or Foreman will shortly require a Re-engagement. Thoroughly acquainted with the Management of Water-Works, the Repairs and Testing of Meters, Distribution of Water, and all duties connected therewith. Address No. 684, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, for the Vera Cruz (Mexico) Gas-Works, a thoroughly active and experienced Man, in the SETTING of RETORTS, MAIN and SERVICE LAYING, FITTING and REPAIRING and TESTING of METERS. One with some knowledge of the Spanish language would have preference. Salary £250 per year. Applications to be made by letter only, addressed JOHN A. MURPHY, Gas-Works, Cirencester, GLOUCESTERSHIRE.

MR. CORBET WOODALL, C.E.,
Has Removed his Office to
PALACE CHAMBERS, BRIDGE STREET,
WESTMINSTER, S.W.,
where he may be consulted by Gas Companies or Municipal Corporations upon any matters relating to Gas Manufacture or Supply.

TO GAS MANAGERS.

WANTED, for the Tralee Gas-Works, a competent ENGINEER and MANAGER. Salary £120 a year, with house, fuel, and light. Applications, with testimonials, stating age, &c., to be forwarded to the Town Clerk not later than Monday, the 6th of September next.
By order,
JAMES COFFEY, Town Clerk.
Aug. 12, 1880.

ACCOUNTANT WANTED.

WANTED immediately, by a Gas Com- pany in South Wales, a thoroughly experienced and efficient ACCOUNTANT, who will have to undertake the entire duties, and the Preparation of the Half-Yearly Accounts, in accordance with the most improved system of Book-keeping. Salary £150 per annum. Applications (in own handwriting, to state age, present and past engagements, accompanied with copies of testimonials) to be addressed to No. 680, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED at once, by the Shrewsbury Gaslight Company, a thoroughly efficient General FOREMAN, who understands the Manufacture of Gas and the Plant and Machinery connected therewith. None but those whose characters will bear strict investigation need apply. Applications, in own handwriting, stating age and qualifications, to be sent to the undersigned, and to be accompanied by recent testimonials. A married man without family preferred. Wages 32s. per week, with house, coals, and gas.
By order,
WM. BELTON, Secretary and Manager.
Gas-Works, Shrewsbury, Aug. 20, 1880.

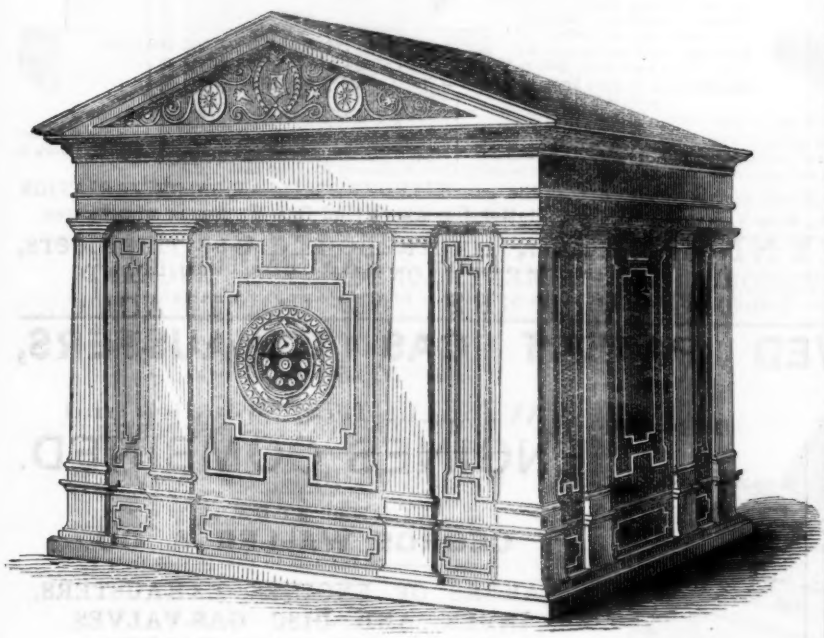
THE

LANCASHIRE GAS-METER COMPANY,

LIMITED,

FALCON METER WORKS,

OLDHAM.



MANUFACTURERS OF

WET AND DRY METERS,

Station-Meters, Station-Governors, Pressure-Registers, &c., &c.

All inquiries will be promptly attended to by

HY. THOMAS, Managing Director.

WANTED, by the Eastbourne Gas Company, a SERVICE-LAYER; one accustomed to Laying Mains, Services, Fixing Meters, Taking Meter Indices. Must have good references and testimonials from former employers. Salary to commence 27s. (twenty-seven) per week.
Apply to the MANAGER, at the Gas-Works.

WANTED, a Steady Man, of good character, as STOKER at a Country Gas-Works. Average wages, 26s. per week.
Application, with references, to be made to the SECRETARY, Gas-Works, Winsford, CHESHIRE.

FOR SALE.—In consequence of the decease of Mr. Milne, a GAS-WORKS in a small Manufacturing Town in Ulster. Present make 1¼ millions, which might be increased.
For particulars apply to ALEXR. MILNE AND CO., Gas-Works Lessees and Engineers, 11, Chichester Street, BELFAST.

ON SALE—The Cast-Iron Fire Doors, Mouthpieces, Ascension, H, and Dip Pipes, Hydraulic Mains, &c., belonging to six settings of six retorts; One Station Meter to pass 8000 feet per hour (makers West and Gregson); also nine D-shaped clay retorts, 16 in. by 14 in. by 8 feet.
The above are in capital condition, and can be seen at the Gas-Works, Guildford. No reasonable offer refused.
Further particulars on application to Mr. LONGWORTH, Gas Offices, GUILDFORD.

STATION-METER FOR SALE.

THE Gas Committee of the Corporation of Rochdale offer FOR SALE a STATION-METER, capacity 25,000 cubic feet per hour, 12-in. Connections, Hydraulic Valves and Bye-Pass, and all other necessary Fittings. The Meter is to be removed in consequence of extensions.
Any further information thereon can be had on application to Mr. W. Romans.
Gas-Works, Aug. 9, 1880.

TO IRONFOUNDERS AND OTHERS.

THE Local Board for the district of Ashton-in-Makerfield invite TENDERS for the Supply and Fixing, at their Gas-Works, of four 7-ft. PURIFIERS, with Centre-Valve, Hoisting Apparatus, and all other necessary Fittings; also for a Set of 8-in. CONDENSERS, with all Fittings connected therewith.
Plans and specifications can be seen at the Offices of the Board, Bryn Street, Ashton-in-Makerfield; and copies of the same may be obtained on payment of 10s., which will be returned on receipt of a *bonâ fide* tender.
Tenders, endorsed "Tender for Purifiers, &c.," to be sent in to me, the undersigned, not later than Monday, Sept. 13, 1880.
The lowest tender not necessarily accepted.
J. E. FAIRLESS, Clerk to the Board.

GAS PLANT FOR SALE.

THE Maidstone Gas Company having enlarged their Works, offer the following Apparatus for Sale in good condition:—
SCRUBBERS.—One Tower Scrubber 30 ft. high by 10 ft. diameter, with Distributor, and partly fitted with Livesey's boards.
CONDENSERS.—One Set of Annular Condensers, consisting of 9 Pipes 17 ft. high, outer diameter 2 ft. 6 in., fitted with 12-in. Valves complete.
ENGINES.—Two 12-Horse Power Horizontal Engines in very good condition.
STATION-METER.—By Milne and Son, in first-class condition, ornamental case, with Valves and Bye-pass complete; to pass 20,000 cubic feet per hour.
HYDRAULIC MAIN.—Six 8 ft. by 18 in. Hydraulic Main D wrought iron; 24 8 ft. 9 in. by 18 in. Hydraulic Main D wrought iron. Nearly new.
RETORTS.—31 Rounds, 15 in. diameter and 9½ ft. long, in two pieces. 2 Ovals, 21 in. by 15 in. and 9 ft. long, in one piece. All of Stourbridge Fire-Clay, and in good condition.
For further particulars and price apply to
JOHN WEST, Engineer and Manager.
Gas Works, Maidstone, April 21, 1880.

CONTRACT FOR TAR.

THE Cork Gas Consumers Company are prepared to receive TENDERS for the Surplus TAR produced at their Works, for One year from September, 1880. Quantity about 140,000 gallons.
Tenders, endorsed "Tender for Tar," will be received up to Friday, Sept. 17.
By order,
DENNY LANE, Secretary.

TENDERS FOR REMOVAL OF GASHOLDER.

THE Buxton Local Board invite Tenders for REMOVING a Telescope HOLDER, 45 ft. diameter, 18 ft. deep, with Six Columns, Girders, and Inlet and Outlet Pipes, from their old Works in Buxton to their new one in Ashwood Dale.
Particulars may be obtained of Mr. Geo. Smedley, Engineer, Gas-Works, Buxton.
Tenders, endorsed "Tender for Removal of Gasholder," to be sent in not later than the 10th of September next, addressed to the Chairman of Gas Committee.
By order,
JOSIAH TAYLOR, Clerk.
Buxton, Aug. 21, 1880.

THE Stretford Gas Company are pre- pared to receive TENDERS for the GAS TAR and AMMONIACAL LIQUOR produced at their Works, together or separately, for a period of Two or Three years, commencing on the 1st of November next.
Tenders to be sent in addressed to the Chairman, and endorsed "Tender for Tar, &c.," on or before Monday, Sept. 6 next.
The Directors do not bind themselves to accept the highest or any tender.
Arrangements can be made to load the same in boats alongside the Works.
BENJAMIN HAYNES, Secretary.
Stretford, near Manchester, July 17, 1880.

STOCK OF THE BRISTOL UNITED GASLIGHT COMPANY.

MESSRS. H. R. FARGUS & CO. will Sell by Auction, in pursuance and under the provisions of the Bristol United Gaslight Company's Act, 1873, at their Sale-Room, 4, Clare Street, in the City of Bristol, on Thursday, Sept. 16th, 1880, at Two o'clock precisely, £20,000 CAPITAL STOCK, issued by them under the authority of the above-named Act.

The Stock will be Sold in Lots of £100 each.

For conditions of sale and any further particulars, apply to the AUCTIONEERS, Clare Street, BRISTOL; to the SECRETARY of the Company, Canons Marsh, BRISTOL; or to Messrs. BRITTANS, LIVETT, AND MILLER, Solicitors, Albion Chambers, BRISTOL.

GAS PLANT FOR SALE.

THE Buxton Local Board invite Tenders for the Purchase of the following:—

28 Mouthpieces—Lids, 20 in. by 14 in.; 40 ft. of Hydraulic Main and all Connections complete.

A Condenser, consisting of 16 6-in. and four 10-in. Vertical Pipes and 12-in. Receiving Mains.

A Whimster's Exhaust Washer to pass 12,000 ft. per hour, with Engine, Bye-Pass, Throttle Valve, and Governor complete.

Four Purifiers, 8 ft. by 8 ft. by 4 ft. 6 in., Wood Grids and Dry Centre-Valve and 8-in. Connecting Pipes.

Station-Meter to pass 6000 ft. per hour, with 8-in. Connections and Bye-pass complete.

Gasholder, 50 ft. by 16 ft., Six Columns, Girders, &c.

Boiler and Fittings complete, 10 ft. by 3 ft. 6 in.

For further particulars apply to Mr. Geo. Smedley, Sen. Engineer, Gas Office, Buxton.

By order,
JOSIAH TAYLOR, Clerk.

Buxton, Aug. 21, 1880.

THE Gloucester Gas Company, ceasing to manufacture gas at their old works, will have the undermentioned APPARATUS for Sale about the beginning of August, viz.:—

About 150 feet of D-shape Wrought-Iron Hydraulic Main, size 19 in. by 19 in. Also about 38 ft. of D-shaped Wrought-Iron Hydraulic Main, size 20 in. by 20 in. Annular Condenser, consisting of six Vertical Pipes, 24 in. diameter, 19 ft. high, with three 12-in. Slide-Valves and 12-in. Connections.

Scrubber (round), 5 ft. by 20 ft., with three 12-in. Slide-Valves, and 12-in. Connections.

Exhauster (Jones) to pass about 15,000 feet per hour.

Exhauster (Beales) to pass about 25,000 feet per hour.

Two Vertical Steam-Engines, each about 6-horse powe with Pulleys, and Shafting used for driving the above.

Boiler 14 ft. 6 in. by 8 ft. 6 in., with Centre Tube, and four Galloway Patent Tubes.

4-horse power Horizontal Steam-Engine.

Three 4-in. Pumps, with cranked Shafting and a pair of Mitre Wheels.

Two Purifiers, 16 ft. by 8 ft., with six 12-in. Slide-Valves and 12-in. Connections.

Gasholder, Double Lift, with Cast-Iron Tank, capacity 37,000 feet.

Gasholder, Double Lift, capacity 100,000 feet.

Gasholder, Double Lift, capacity 240,000 feet.

One 12-in. Governor, by Wright, London, with 12-in. Valves, Bye-Pass, and Connections.

Two 12-in. four-way faced Valves, by Cockey.

For further information, &c., apply to the undersigned.

R. MORLAND, Engineer.

ALEXANDRA PALACE.

LIGHT EXHIBITION AND MART.

September 27 to October 9, 1880.

ENTRIES CLOSE SEPT. 20.

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Class 1. Motors suitable for Driving Dynamo Machines.
Class 2. Dynamo Electric Machines.
Class 3. Electric Lamps and Carbons.
Class 4. Photometers especially applicable to Electric Light Measurement.
Class 5. Miscellaneous Electrical Apparatus for Sale.

SECTION B.

Class 1. Gas Apparatus, including Portable Gas-Works, Fittings, Burners, &c.
Class 2. Candles of all kinds.
Class 3. Petroleum and Oil Lamps, and all applications of Petroleum and Oil to Lighting purposes.
Class 4. Miscellaneous Apparatus, not included in any of the above, as Gas-Stoves, Oil-Stoves, Reflectors, &c.

For forms of entry, &c., apply to Mr. G. GROUT, ALEXANDRA PALACE, N.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

Price 28s. each, handsomely bound in Morocco, cloth sides, gilt edged and lettered.

THE FIRST AND SECOND VOLUMES
OF
KING'S TREATISE
On the Science and Practice of the Manufacture and Distribution of
COAL GAS.

Edited by THOS. NEWBIGGING, C.E., M.Inst.C.E., and W. T. FEWTRELL, F.C.S.

Orders received by
WALTER KING, 11, Bolt Court, Fleet Street, London, E.C.

JOHN HALL AND CO., STOURBRIDGE,

Manufacturers of FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

N.B.—A Stock of 15 and 16 in. CIRCULAR RETORTS always on hand. Other kinds made to order on short Notice.

J. & H. ROBUS,

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FOR THE ERECTION AND REBUILDING OF GAS AND WATER WORKS,

RETORT-SETTING—A SPÉCIALITÉ.

ROBUS'S IMPROVED RETORT-SETTINGS, guaranteed to Carbonize a large amount of Coal with a small per cent. of Fuel.

ESTIMATES GIVEN FOR MAIN-LAYING.

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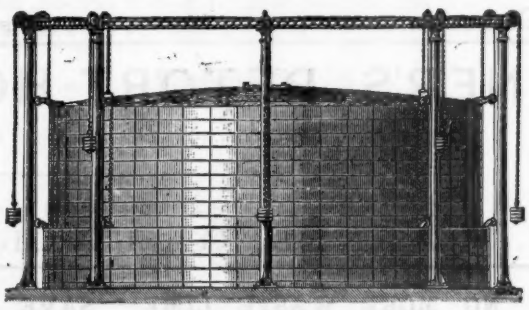
ATLAS METER-WORKS, OLDHAM,

MANUFACTURERS OF

WET AND DRY GAS-METERS,
STATION-METERS, GOVERNORS,
PRESSURE AND EXHAUST REGISTERS,
LAMP-METERS IN CAST-IRON BOXES,

And every Description of Gas Apparatus.



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GAS ENGINEERS & MANUFACTURERS,

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GOWTS BRIDGE WORKS,

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LONDON OFFICES: 1, WESTMINSTER CHAMBERS, S.W.

ESTIMATES FOR GAS-WORKS OF ANY SIZE.

REFERENCES TO 500 WORKS ALREADY ERECTED.

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GAS MANAGER'S HANDBOOK.

By THOMAS NEWBIGGING, M.I.C.E.

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JAMES MILNE & SON,

GAS ENGINEERS,

Gas-Meter, Gas Apparatus, and Gas-Fittings Manufacturers,

EDINBURGH, AND

2, KING EDWARD STREET,

NEWGATE STREET, LONDON.

STATION-METERS GOVERNORS, CONSUMERS METERS, GAS LUSTRES, CHANDELIERS, BRACKETS, &c.,

And every description of Gas-Fittings and Gas Apparatus.

BELGIAN CLAY RETORTS.

J. SUGG and CO., late ALBERT KELLER, GHENT.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Messrs. Sugg, of Ghent, beg to draw the attention of the Gas Companies of London, and other Cities, to the very superior quality of the RETORTS manufactured by them. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.

Communications addressed to J. SUGG & Co., GHENT, will receive immediate attention.

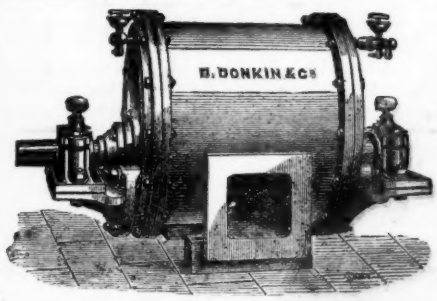
THE

SILICA FIRE-BRICK CO.,

OUGHTIBRIDGE

Near SHEFFIELD,

Manufacturers of THE ORIGINAL SILICA OR DINAS FIRE-BRICKS. Specially adapted for Gas-Retort Furnaces and for Siemens's Gas-Furnaces. Shipments promptly executed to London, Liverpool, Hull, Grimsby, &c.



NEW PATENT GAS-EXHAUSTERS.

[J. BEALE'S.]

MESSRS. B. DONKIN & Co. possess the sole right to manufacture J. Beale's Exhausters under his new patent.

MADE WITH TWO OUTSIDE BEARINGS AND LATEST IMPROVEMENTS.

ALSO MANUFACTURERS OF

IMPROVED GAS AND WATER VALVES, STEAM-ENGINES, &c., &c.

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ECONOMY IN THE PRODUCTION OF GAS.

PLUTONIC CEMENT,

FOR JOINTING AND REPAIRING RETORTS AND OVENS *in* ACTION AND *out of* ACTION.

Pamphlet on the advantages of the above, with Modes of Application, References, Prices, &c., free by post, from the Sole Manufacturer,

WILLIAM RICHARDSON, Gas and Hydraulic Engineer, CHARLES HENRY STREET, and BISSELL STREET, BIRMINGHAM.

WARNER'S RETORT-HOUSE MACHINERY.

[*As Illustrated and Described in the* JOURNAL *for May* 4.]

Communications to be addressed to

W. J. WARNER, GAS-WORKS, SOUTH SHIELDS.

NO MORE WASTE LIME! SAVE THE VALUABLE PRODUCT!

G. R. HISLOP'S PATENT REGENERATIVE PROCESS

Most Effectively and Economically restores this waste *ad infinitum*.

The Patentee having devoted more time and attention to this subject than perhaps any other person living, is now in a position to recommend the adoption of this process to Gas Companies and Corporations with the utmost confidence in its practical utility, convenience, and economy. 1st. It restores the spent Lime at from one-third to one-half its original cost, apart from its undoubted convenience and the economy of space. 2nd. There is practically no limit to the duration of the Lime. 3rd. The cost of apparatus for the introduction of the process is very moderate and exceedingly durable. 4. The Patentee supplies special bricks and castings, erects and proves the process on the most favourable terms.

The process, in operation, may be seen at the Corporation Gas-Works, Paisley, where the Lime has been restored 120 times. Inspection is cordially invited.

For Terms, apply to GEO. R. HISLOP, F.C.S., Engineer, Gas-Works, PAISLEY, N.B.

HANNA, DONALD, & WILSON,

(ESTABLISHED 1851,)

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IMPROVED FIXED OR TRAVELLING HYDRAULIC PURIFIER-COVER LIFTERS,

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TAR AND LIQUOR PUMPS, HYDRAULIC SLUICE AND SLIDE VALVES, LAMP-POSTS AND HYDRANTS COMBINED.

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WILLIAM SUGG'S

IMPROVED

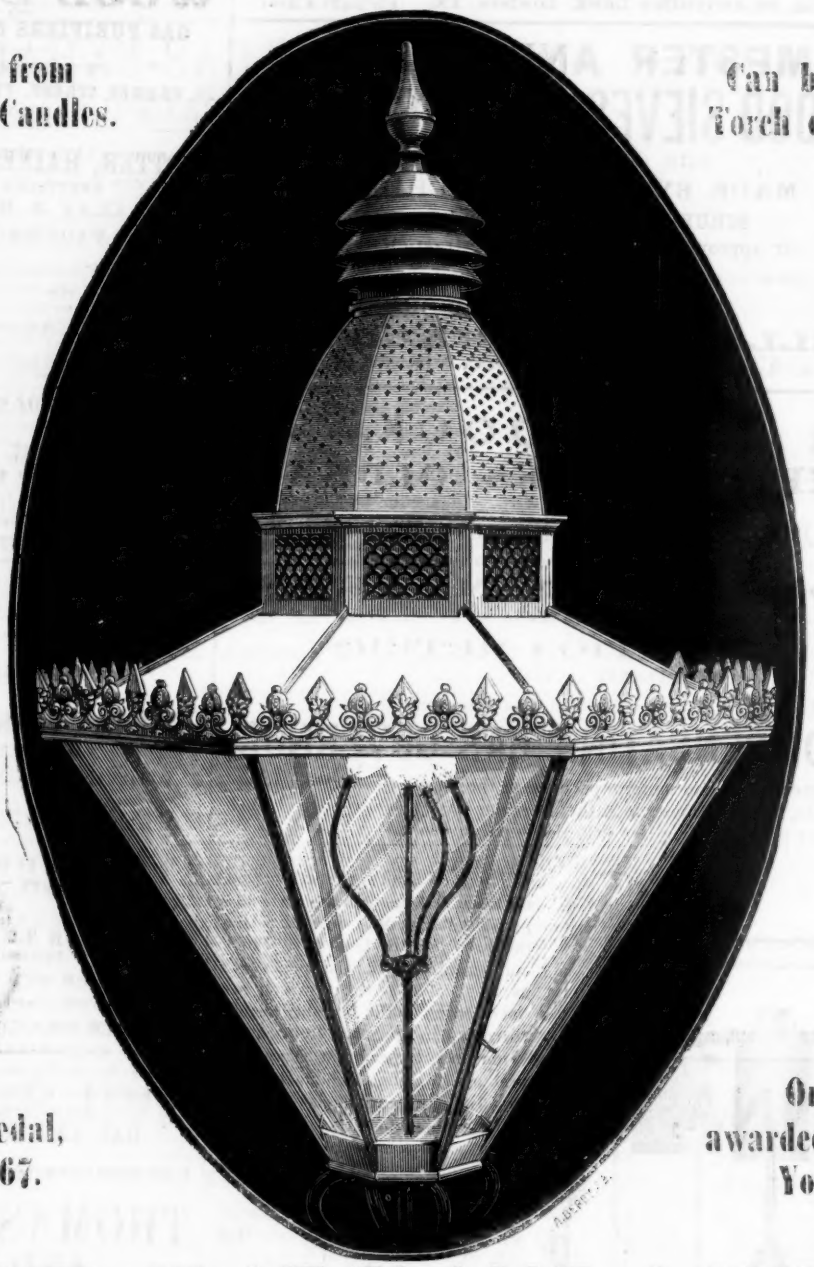
SYSTEM OF LIGHTING STREET REFUGES, &c.,

With Patent Shadowless Lanterns and Flat-Flame Burners of High Illuminating Power, suitable for Cannel or Common Gas.

THE "WESTMINSTER"

Sizes vary from 100 to 200 Candles.

Can be lighted by Torch or Centre Jet.



Two Gold Medals,

Paris, 1878.

CLASSES 13 & 31.

LONDON, 1862.

Two Gold Medals,

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CLASSES 13 & 31.

LONDON, 1862.

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PATENT FLAT-FLAME LANTERN,

(REGISTERED DESIGN,)

Made the following Powers of Light, 100, 150, and 200 Candles.

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WILLIAM SUGG, ENGINEER,

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For Heating only.

RITCHIE'S
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HEATING AND LIGHTING
STOVES.

Silver Medal awarded in 1878, at Wolverhampton Exhibition.

No Injury to Pictures or Plants.
No Flue.
No Danger from Fire.
No Offensive Smell.
Light and Warmth combined.
Cost less than other Fuel.

Messrs. RITCHIE & Co. are prepared to supply these Stoves on the best possible terms to Gas Companies to let out to their Consumers on the hire system.

Prices from 50s. to £10 10s.

Full Particulars and Testimonials forwarded on application to

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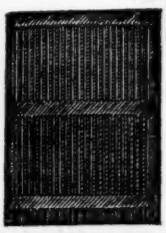
For Light & Heat.

R. DEMPSTER AND SON'S



WOOD SIEVES FOR PURIFIERS,

WITH TAPER OR PARALLEL BARS,
MADE BY SPECIAL MACHINERY.
SCRUBBERS FILLED WITH BOARDS,
On our approved principle, for the extraction of Ammonia.
Prices on application. References to First-Class Engineers.
ROSE MOUNT IRON-WORKS,
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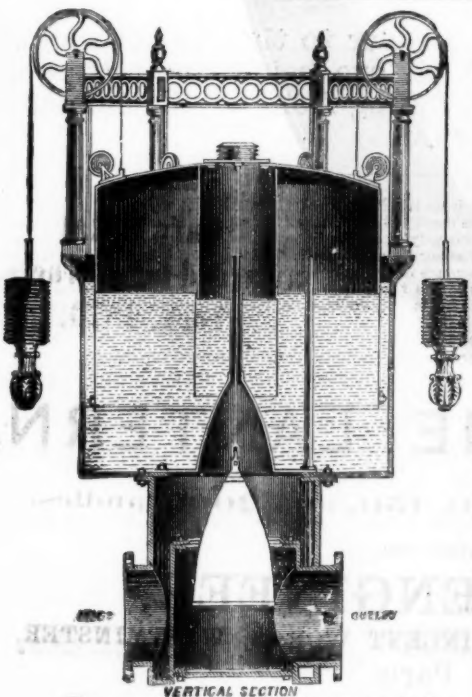
GLOBE METER-WORKS, OLDHAM,
MANUFACTURERS OF
WET AND DRY CONSUMERS GAS-METERS,
OF THE HIGHEST EXCELLENCE ONLY;
ROUND STATION-METERS,
ON CAST-IRON STANDS;
SQUARE STATION-METERS,
WITH PLANED JOINTS.

Messrs. BRADDOCK beg to submit to Gas Engineers their

PATENT COMPENSATING GAS GOVERNOR,

Which is designed to give an uniform pressure at the Outlet to the Main at all draughts up to the full quantities which the Governors are made to control, such outlet pressure being less than the initial pressure.



VERTICAL SECTION

They can be made with Float in the Bell, or counterpoise as per section.

The uniformity of pressure is obtained by introducing a compensating chamber into the Bell or Holder of the Governor, which compensator is of the same area as the valve, both of which are operated on by the initial pressure, thereby placing the valve in equilibrium, no matter what the initial pressure may be. The action on the Bell is by the Gas passing along a pipe from the outlet, and the pressure is regulated by weights in connexion with the Bell as required.

From the sectional elevation attached hereto, it will be seen that only the Gas required to operate the Bell comes in contact with the water of the tank, which water will remain comparatively sweet and free from odour. That in case of accident to the Bell, no more Gas can escape than would pass up the pipe covering the valve-rod and Bell supply-pipe.

These Governors have been made and sent out of various sizes for from 2 to 30-inch Mains, and give most satisfactory results.

C. & W. WALKER'S
WOOD PURIFIER SIEVES,

Which have now been used for fifteen years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

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ESTABLISHED IN 1860.

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WOOD SIEVES
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GAS PURIFIERS & SCRUBBERS.

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Manufacturers of GAS-RETORTS, GLASS-HOUSE FURNACE & BLAST-FURNACE BRICKS LUMPS TILES, and every description of FIRE-BRICK.
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SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

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ALFRETON IRON-WORKS, DERBYSHIRE,
AND
WENLOCK IRON WHARF, 21 & 22, WHARF ROAD, CITY ROAD, LONDON, N.,

Manufacture and keep in stock at their works (also a large stock in London) PIPES and CONNECTIONS 1½ to 48 inches in diameter; and make to order Retorts, Purifiers, and Tanks, with or without planed joints, Columns, Girders, Special Castings, required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Syphons and Covers are joint-faced if required, doing away with millboard and iron boring, or Syphons made without Covers, a socket being cast on and fitted with a small plug about 6 inches in diameter with lead joint. In either way preventing leakage.

GEORGE'S
Patent Gas Calorigen,
A STOVE FOR
WARMING AND VENTILATING.
RECOMMENDED BY DR. RICHARDSON.

MANUFACTURERS:
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JAMES NEWTON & SONS,
(Established 1820,)
FIRE-BRICK AND TILE MERCHANTS,
Wholesale and for Exportation,
FALCON DOCK, 78 AND 79, BANKSIDE,
SOUTHWARK, LONDON, S.E.,
DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES, and FIRE-CLAY, and every Article suitable for
GAS AND WATER WORKS.

Gold Medal Awarded, Paris Exhibition, 1878.

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SHEAF AND SPRING WORKS,
SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS,
STEEL OF ALL DESCRIPTIONS,
SCREW STOCKS, TAPS, AND DIES, SPANNERS
RATCHET BRACES, LIFTING-JACKS,
ANVILS, VICES,
AND ENGINEERS TOOLS GENERALLY.
LONDON OFFICE:
90 CANNON STREET, E.C.

The understated declaration with which we introduced our apparatus when the Argand system was in the full tide of its fame, has been fully borne out by general experience, namely—

"THE FLAT-FLAME IS THE ONLY PRACTICABLE SYSTEM FOR STREET LIGHTING; and, 'in actual use,' yields as much light with Common Gas, and more with Cannel Gas, than any Argand System."

CHARLES HUNT, Esq. (President of the British Association of Gas Managers), in his Inaugural Address to the members at their annual meeting, held in London, June, 1880, said: "Rivalry has stimulated into being, for outdoor purposes mainly, Burners of large power, that have fully maintained the superiority of coal gas over the electric light. To Mr. Bray our thanks are due for his development of the FLAT-FLAME BURNER into a lighting medium of a very high order, *and for his vindication of its claims to practical consideration.*"

The above declaration was received with marked applause by the crowded meeting.

BIRMINGHAM LAMP TESTS.

AFTER the most exhaustive series of experiments, extending over more than twelve months, with the most extensive assortment of Burners and Lanterns of large lighting power ever brought together, the Birmingham Authorities have

ADOPTED BRAY'S SYSTEM

for their Street-Lighting Improvements, for which purpose Sixty-Five 100-candles power Lanterns of medium lighting power are being fixed.

The apparatus used in the above tests were all of our usual medium lighting power class, and the tests showed that we sacrifice a considerable amount of lighting power for general efficiency. The tests further showed that our 80*-candles* HIGHEST *lighting power burner yielded* 3·51 *candles per foot of gas—the quality being* 16·75 *candles* (3·35 *per foot*) *by the standard—which was a higher result than that yielded by any other flat-flame burner, though copies of our Slit-Unions, enlarged and improved by us Jan.,* 1879, *were used by our competitor; and higher than the* 80*-candles power Argands.*

NOTE.—The above is the most conclusive answer to the ever-changing and misleading statements which are being made by our competitor, with the object of taking from us the honours we have secured in open contest.

Extract from the *Leeds Mercury*, April 1, 1880.

At the meeting of the Leeds Town Council, March 31, Alderman Gaunt moved that the Council approve of the acceptance by the Corporate Property Committee of the tender of Messrs. Geo. Bray and Co. for the supply of 21 new lamps, to be placed upon the pillars round the Town Hall. The Committee had tested Sugg's and other lamps, and found Messrs. Bray's the best. It was intended to have two 200-candles power and two 100-candles power, and 17 round the hall of 80-candles power. Mr. Lynd, in seconding the motion, said that he had had an opportunity of seeing different lamps tested at Birmingham, and he was in favour of Messrs. Bray's.

Extract from the *Daily Free Press*, Aberdeen, Jan. 1, 1880.

Judging of the merits of the lights as they appeared last night, on-lookers seemed to be generally of opinion that between Sugg's patent and Bray's larger light at the corner of Union Buildings, Castle Street, there was no perceptible difference in the illuminating power. When the vital question of gas consumption is taken into account, it is found that in the Castle Street lamps there is a marked difference in the quantity of gas consumed, for while 30 feet of gas are hourly burned in Sugg's Patent Lamp, only 20 feet are used by Bray's Lamp during the same period.

[The above Lamps have Meters attached.]

BRAY'S LANTERNS have been adopted by the Vestry of St. George, Hanover Square, London, for all the crossings and refuges of that important district, after a direct competition with the Argand system of lighting.

Also more than 50 Towns and Vestries have adopted them, after a similar competition in most cases; and many private users. In all cases they are a pronounced success.

GEORGE BRAY & CO., BLACKMAN LANE, LEEDS.

June, 1880.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

Meeting at Perth, July, 1880.

In his Inaugural Address the President (Mr. Robb) spoke of knowing, from his personal experience, "what it is to face an inspection of Wet Meters, with all its disagreeable concomitants;" and, referring to the use of Dry Meters by some Corporations and Gas Companies, he expressed the hope that "the encouragement thus given to manufacturers will stimulate them to improve and perfect the Dry Meter." From this it would appear that to improve and perfect the Dry Meter is, according to Mr. Robb, a work still requiring to be done—an opinion it is not in our power to refute.

The "disagreeable concomitants" experienced by those who have to "face an inspection of Wet Meters" arise solely from the "watering," for in all others respects "an inspection of *Wet* Meters" differs nothing from an inspection of *Dry* Meters.

When ordinary Meters are used, watering is a necessary part of every inspection, and the fact that the Meter registers more gas at a high than at a low water-level makes the operation in many cases unpopular. Hence the "disagreeable concomitants" which sometimes attend it.

Mr. Robb found "33 cubic inches of water per Meter per annum as the quantity requisite to supply a 3-light Meter for a year." This statement, being the result of his personal experience, may be accepted as correct, and justifies us in stating that the WARNER & COWAN METER need not be watered more frequently than once in twelve months at the very utmost, for the 3-light Meter may have withdrawn from it upwards of 64 cubic inches of water before the valve closes. This quantity is nearly double that stated by Mr. Robb as sufficient for a year.

The value of the unvarying accuracy of the WARNER & COWAN METER is thus greatly enhanced by the increased range of water-line thereby obtained. With regard to larger sizes the same remarks will hold good. For example, there may be withdrawn from the 100-light Meter 4 gallons of water, and from the 300-light 17 gallons, before the valve will close. When watering is necessary at the rare intervals indicated, it is regarded without suspicion by the consumer, who for the sake of his gas supply is the person most interested in the operation.

W. & B. COWAN,

(ESTABLISHED 1827,)

WET & DRY GAS-METER MANUFACTURERS,

CHURCH ST., MILLBANK ST., *LONDON, S.W.* | DUTTON ST., NEW BRIDGE ST., *MANCHESTER.* | BUCCLEUCH ST. WORKS, *EDINBURGH.*

THE MANN & WALKERS' PATENT SCRUBBER.

Extensive use. The successful and extensive use of the Mann and Walkers' Patent Scrubbers in all parts of the world has demonstrated their advantages, and entitled them to be received with credit and confidence. The number of them in use is about twenty times that of any other known means of purifying gas from ammonia.

Small quantity of Water required. By a very small quantity of clean water (not more than 5 or 6 gallons per ton of coals carbonized) the whole of the Ammonia contained in the Gas is completely absorbed; the Gas, after only once passing through, issuing from the Scrubber outlet completely purified from Ammonia. The Scrubber gives no appreciable back pressure.

Residual Product obtained. The Residual Product—namely, the Ammoniacal Liquor—is obtained at from 20 to 30 ounces commercial strength, which enables it, after being mixed with the weaker Liquor from the hydraulic main and condensers, to be sold to the Manufacturing Chemists, or converted into Sulphate, at the degree of strength found most profitable to the Gas Company.

Illuminating power increased. The Scrubber is a Saturator, and the Gas being soaked in this strong solution of Ammonia in the lower columns of the Scrubber, is purified from a large amount of Carbonic Acid, and its Illuminating Power is thereby increased.

Small amount of power required. The friction is so little, and the motion so slow, that the power necessary to work the Scrubber is almost inappreciable. A small gas-engine will work a pair of Scrubbers, purifying 2 million cubic feet of gas per day.

Beckton Gas-Works. There are thirty of these Patent Scrubbers in the Beckton Gas-Works, equal to purifying 30 million cubic feet per day, and the total amount of engine power necessary to work the whole 30 is not equal to that given out by one 10-horse engine.

Reserve purifying power contained. There is also a most important advantage arising from the height of these Scrubbers, in the reserve force contained in them. In the event of any stoppage, the mass of soaked and wetted material would continue the purification for hours, even if the supply of water and working were stopped from any cause.

Internal Materials not changed. The changing of the soaking materials in these Scrubbers is very seldom required; they are well known to remain in action for seven years without being emptied.

Guarantee They are in all cases erected under guarantees; they easily fulfil the stipulations of any Act of Parliament, and the chemical restrictions of the Board of Trade; and in cost they are much less to a Gas Company than any other known means of purifying Gas from Ammonia.

C. & W. WALKER.

8, *Finsbury Circus, London, E.C.*

F. & C. OSLER,

45, OXFORD STREET, LONDON, W.

MANUFACTORY AND SHOW-ROOMS:

BROAD STREET, BIRMINGHAM.

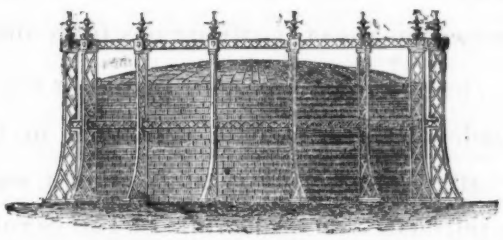
ESTABLISHED 1807.

MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS,

WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES.

TABLE GLASS OF ALL KINDS.

CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.



THE HORSELEY COMPANY,

LIMITED,

TIPTON, STAFFORDSHIRE.

LONDON OFFICE:

6, WESTMINSTER CHAMBERS, VICTORIA STREET,

GAS ENGINEERS, IRONFOUNDERS, &c.,

MANUFACTURERS OF

GASHOLDERS, WROUGHT AND CAST IRON TANKS, CONDENSERS, PURIFIERS, SCRUBBERS, MAINS, RETORT-LIDS, PLAIN AND DISHED, LAMP-POSTS, PIPES,

AND ALL REQUISITES FOR EITHER

GAS OR WATER WORKS;

ALSO

MAKERS OF ROOFS, BRIDGES, &c.

S. OWENS & CO.,

WHITEFRIARS STREET, FLEET STREET, LONDON, E.C.,

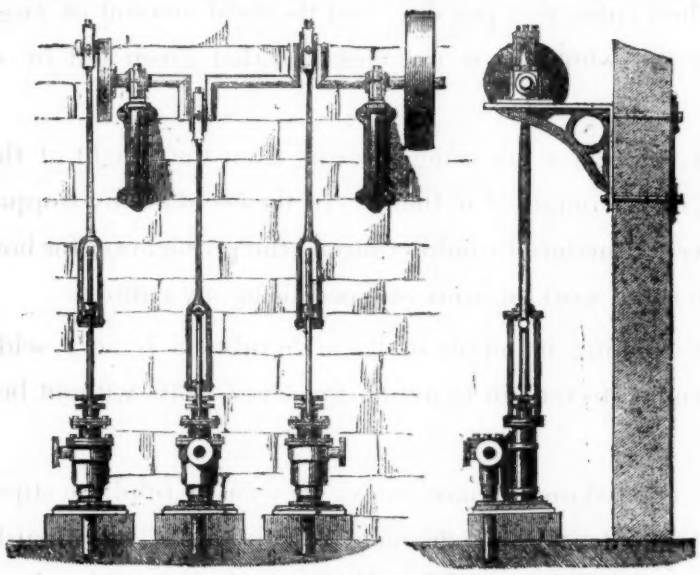
Hydraulic Engineers,

AND MANUFACTURERS OF

PUMPING MACHINERY of every Description.

SOLE LICENSEES AND MANUFACTURERS FOR GREAT BRITAIN OF

BLAKE'S PATENT DIRECT-ACTING STEAM-PUMPS.



IMPROVED DOUBLE-ACTION PUMPS.

For Water. For Tar. For Ammoniacal Liquor.

This illustration shows an arrangement of three (No. 179) Improved Double-Action Pumps driven from the same crank-shaft, as frequently supplied for use in Gas and Chemical Works. The suction and discharge pipes can be arranged for drawing from and delivering in any required direction.

These Pumps have been supplied to nearly all the large Gas Companies and Chemical Works, both for Pumping Water, Tar, and Ammoniacal Liquor.

GAS SYPHON PUMPS, IN COPPER OR SHEET IRON, ALWAYS IN STOCK.

Illustrated Catalogues sent post free on application.

T. NEWBIGGING,

CONSULTING GAS ENGINEER,

5, NORFOLK STREET, MANCHESTER.

HENRY LYON,

MECHANICAL AND CONSULTING GAS ENGINEER,

NORWOOD, NORTHENDEN ROAD,

SALE, NEAR MANCHESTER.

ALFRED LASS, F.I.Accts.,

SPECIAL ACCOUNTANT FOR GAS AND WATER UNDERTAKINGS,

30, GRACECHURCH STREET, LONDON.

Accounts Analyzed and Statistics Prepared for Parliamentary Proceedings, Arbitrations, &c.

The Forms of Account, which have been specially designed by Mr. Lass to meet the requirements of the Gas-Works Clauses Amendment Act, 1871, are now in use by many Gas Companies, Corporations, and Local Boards.

JOHN ROMANS, C.E., F.G.S.E.,

CONSULTING GAS ENGINEER

AND

CANNEL COAL FACTOR,

30, St. Andrew Square, EDINBURGH.

Plans and Estimates furnished; Gas-Works, Apparatus, Pipes, Machinery, Fire Goods, &c., supplied, or Attested and Shipped for Exportation.

GAS-WORKS TAKEN ON LEASE.

Mr. ROMANS has for upwards of 30 years been practically engaged in the Manufacture of Gas, and has, by extensive experiments, ascertained that by JUDICIOUS INTERMIXTURE of the lighter with the heavier gases, much of the rich Hydrocarbons CAN BE SAVED, which otherwise ARE LOST, during the process of manufacture. He is therefore enabled to give advice to those who favour him with their orders for Cannel, as to the class which will secure for their standard of illuminating power the HIGHEST ADVANTAGEOUS RESULTS.

ANALYSIS AND PRICES FORWARDED ON APPLICATION.

THOMAS PROUD,

BROOKFIELD WORKS,

103, ICKNIELD ST., BIRMINGHAM,

MANUFACTURER OF

WOOD GRIDS

FOR

PURIFIERS AND SCRUBBERS,

AND

GENERAL STEEL AND IRON TOOLS AND MATERIAL USED IN GAS-WORKS.

BOX'S PATENT STREET GAS-LAMP

Has the following good qualities:—

1. No putty or other material is required for glazing. Thus there is no hacking out of old putty on removal of the glass, with the *consequent damage* to the lamp frames. 2. No liability to breakage by unequal expansion of the glass caused by changes of temperature. 3. Any inexperienced workman can glaze the lamp in a few minutes. 4. The system of glazing can be applied to any existing lamp at a trifling cost. 5. It is cheap, strong, and durable. 6. The glass can be easily removed so that the frames can be thoroughly painted inside and out.

The lamp may be supplied fitted with clear opal or ribbed glass, *as also with enamel tops* if required. The necessary fittings for altering existing lamps to this system can be supplied at moderate prices and a small charge for royalty. Licences granted on the most reasonable terms. For further particulars apply to the Patentee,

W. W. BOX,

Gas-Works, Crayford, Kent.

RETORT BOLTS,

AND ALL KINDS OF

BOLTS AND NUTS,

SUITABLE FOR

GAS-WORKS,

SUPPLIED BY

JOHN STANSFELD,

Bolt & Nut Manufacturer,

ALFRED ST., BOAR LANE, LEEDS.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

198, St. VINCENT STREET, GLASGOW.

TREES BOGHEAD.

SHOTTS BOGHEAD,

And all the first-class Scotch Cannels.

Prices and Analyses on application.

HEBBURN MAIN GAS COAL.

This Coal is now highly approved of for gas making, and yields over 10,000 feet per ton of 15-candle gas, and about 14 cwt. coke.

For references and prices, either f. o. b. or by rail, apply to

W. RICHARDSON,

29, QUAYSIDE, NEWCASTLE-ON-TYNE.

WANTED, by Samuel Thompson & Co., Colliery Office, Lancaster, APPLICATION for PRICES from Gas Managers who are prepared to receive Tenders for GAS COAL or CANNEL.

John Leigh, Esq., M.R.C.S., F.C.S., &c., &c., in his analytical report of S. T. & Co.'s Coal, says: "It is remarkable for its purity, I have scarcely ever examined a Coal containing so small a quantity of ash, and when Cannel of the best description is scarce, it may well replace this material."

GAS COAL.

POPE & PEARSON, LIMITED, have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields *in practical working over 10,000 cubic feet of gas, with an illuminating power of 16 candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars, apply to Pope and Pearson, Limited, West Riding and Silkstone Collieries, near Leeds.

GAS COAL.

THE MIRFIELD COAL COMPANY are supplying GAS COAL of the best quality on trucks at their siding. This Coal contains 10 per cent. of Cannel, and, as analyzed by Mr. James Paterson, of Warrington, yields 12,600 *cubic feet of 16·67-candle gas, with 1430 lbs. of good Coke, per ton.* Ash in Coke, 1·88.

Apply to the Mirfield Colliery, Mirfield, Normanton. London Agent: Mr. F. J. Lee Smith, Bromley, Kent.

BIRTLEY IRON WORKS,
CHESTER-LE-STREET,
DURHAM.

Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.

Warehouse in London for Cast-Iron Pipes and Connexions of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

Agent in London, Mr. J. Manwaring, 101 Cannon Street, E.C.

WOOD TROUGHING
For Preserving Service-Pipes.
Price from Three-Farthings per Foot,
In any Lengths.

THOS. PROUD,
Brookfield Works, Icknield St., Birmingham.

STEPHEN HOBBS,

OF

CLARENCE VILLA, RAMSGATE,

CONTRACTOR FOR WELL SINKING

AND

SEWERING WORK GENERALLY,

Begs to inform Engineers and others that he has just completed the extensive and important excavations, amounting to 4000 cubic yards, for the Ramsgate Improvement Commissioners (under the direction of their Engineer, Mr. Valon), whereby a good and abundant supply of water has been obtained, and is now in a position to undertake further work in town or country.

References kindly permitted to be made to Mr. William A. Valon, C.E., Ramsgate. Additional testimonials if required.

GAS AND WATER PIPES.

WILLIAM MACLEOD & CO.,

30, ST. ENOCH SQUARE, GLASGOW.

CAST-IRON GAS AND WATER PIPES.

DELIVERY F.O.B., GLASGOW.

Prices on application.

FERRAND DAVIES,

148, GRESHAM HOUSE, OLD BROAD STREET, LONDON, E.C.,

AGENT FOR

THOMAS BARR'S LESMAHAGOW MAIN CANNEL,

AND

NEWTON, CHAMBERS, & CO.'S SILKSTONE GAS COALS.

Analyses and Quotations on application.

WILSON CARTER AND PEARSON,

GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station or for Export all kinds of Fuel for Gas purposes.

Address—**CHIEF OFFICES.**

TEMPLE BUILDINGS, 50, NEW STREET, BIRMINGHAM.

GEORGE ANDERSON,

GAS AND CONSULTING ENGINEER,

35A, GREAT GEORGE STREET,
WESTMINSTER, S.W.,

PATENTEE and MANUFACTURER of the following Inventions:—

RETORT SETTINGS—giving great Economy of Fuel.

STEAM-ENGINES and EXHAUSTERS, FOUR-WAY VALVES, WASHERS, SCRUBBERS.

FUEL-MACHINE, for Compressing Breeze and Tar.

N.B.—Pamphlet, with Twenty-Eight Illustrations and Letterpress, on the Construction of Gas-Works, will be sent, post free, on receipt of 4s. in stamps To be had of the Author; or at the Office of the "Journal of Gas Lighting."

PRICES AND ALL PARTICULARS TO BE HAD OF THE PATENTEE,

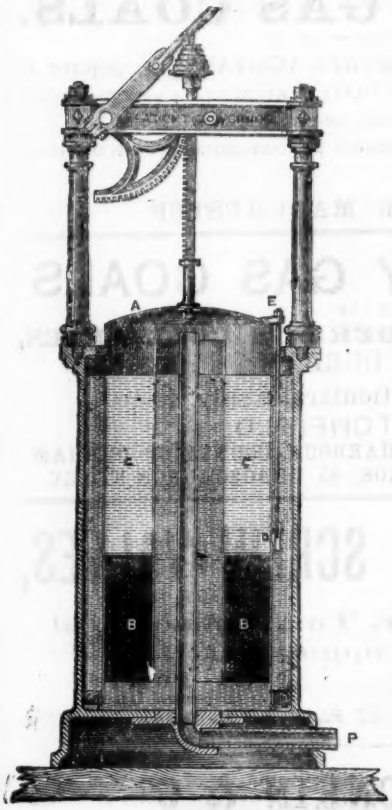
35a, GREAT GEORGE STREET, WESTMINSTER, S.W.

GEORGE WALLER & CO.,

GAS AND HYDRAULIC ENGINEERS,

Patent Compensating Steam Governor,

WITH SELF-CONTAINED WATER-BALANCE.



This is the most efficient and perfect Governor yet made to control and regulate the speed of Engines and Exhausters according to the varying make of gas, and maintain a steady gauge, whether working level or with six inches of seal.

It is the only Governor that will effectually control Condensing and Compound Engines, especially when the Exhauster is on light work, and the Engine is large.

During the drawing and charging of Retorts, the Engine requires no attention—a matter of great importance in small works.

Descriptive Circular sent on application.

They are in use at
BECKTON,
HAMPTON WICK,
DUKINFIELD,
HARTLEPOOL,
NEWCASTLE-ON-TYNE,
RAMSGATE,
SUTTON,
and about 30 other works.

G. W. and Co. make **special Steam Throttle Valves,** suitable for working with this Governor, and alter existing Throttle Valves to same plan.

See also advertisement, page 348.

PHŒNIX ENGINEERING WORKS,
Holland Street and Bear Gardens, Southwark, S.E.

ALDWARKE MAIN AND CAR HOUSE COLLIERIES,

Near ROTHERHAM.

JOHN BROWN & CO., LIMITED,

ATLAS STEEL AND IRON WORKS, SHEFFIELD.

PROPRIETORS.

The Aldwarke Main Brights is a first-class gas-making and coking Coal, yielding by analysis 12,600 feet of 19-candle gas per ton, and giving "Weight of illuminating matter in lbs. of sperm, 820·80." It is very free from impurities and foreign matter.

Copies of Analyses made by Gas Companies who have used it will be forwarded and Samples sent on application.

THE LOCHORE & CAPLEDRAE CANNEL COAL COMPANY,

Limited,

Beg to intimate that the development of their Mines is progressing favourably, and that they are now in a position to supply their famous Cannels.

Quotations and full Analyses will be supplied on application addressed to the Company,

LOCHGELLY, FIFESHIRE, N.B.

Abstract of Analyses made by Dr. WALLACE, Gas Analyst for the City of Glasgow.

	Cubic Feet per Ton.		Illuminating Power.		Equivalent of a Ton in Sperm.
Plesio Boghead	13,165	....	36·16	....	1632
Brown Capledrae	12,210	....	38·46	....	1610

GAS COAL. GAS COAL. GAS COAL.

WELLS, BIRCH, RYDE, and CO., Limited,

HOYLAND SILKSTONE COLLIERIES,

Near BARNSLEY.

This Company is now in a position to raise **2000 tons per day of REAL OLD SILKSTONE GAS COAL.**

"The quality of this Coal for Gas purposes, if equalled, is not excelled by any on record, and the Coke competes successfully with best Durham."—See *Mining Journal*, Aug. 11, 1877.

Prices quoted to any Railway Station, or F.O.B. Hull, Grimsby, Goole, Keadby, Liverpool, and Fleetwood.

Full particulars will be sent on application to above address.

THE WIGAN COAL & IRON COMPANY,

LIMITED.

MIDLAND DISTRICT OFFICE: 97, NEW STREET, BIRMINGHAM; AGENT: A. C. SCRIVENER,

Supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, &c.

N.B.—The Wigan Coal and Iron Company, Limited, are exclusive owners of the well-known **HAIGH HALL AND KIRKLESS HALL GAS COAL COLLIERIES.**

CANNEL AND GAS COALS.

THE DUKINFIELD COAL AND CANNEL COMPANY are prepared to deliver, to any Station, their Celebrated GAS COALS, which have a very high reputation for quantity of Gas and Illuminating Power, and make a First-class Coke.

Analyses and terms of delivery may be obtained by communicating with the above Company, at their Offices,

DUKINFIELD, NEAR MANCHESTER.

LONDONDERRY GAS COALS

DIRECT FROM THE

MARQUESS OF LONDONDERRY'S COLLIERIES.

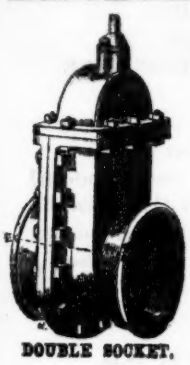
COUNTY OF DURHAM.

For Prices and Particulars, apply to

MR. S. J. DITCHFIELD,

LONDONDERRY OFFICES, SEAHAM HARBOUR, COUNTY OF DURHAM.

London Agents: Messrs. LAMBERT BROS., 85, GRACECHURCH ST., E.C.



DOUBLE SOCKET.

IMPROVED SCREW-VALVES,

For Water, Tar, Ammoniacal Liquor, &c.

MADE EITHER WITH FLANGED OR SOCKET ENDS.

B. DONKIN & Co.

BERMONDSEY, LONDON, S.E.

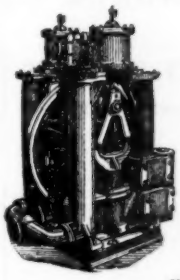
PRICE'S PATENT COKE & COAL BARROW

effecting a great saving of time, labour, and expense.

For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, Gas-Works, Hampton Wick, MIDDLESEX.

Prices are Reduced.

John Cameron's Specialities



ARE HIS

PATENT LEVER

PUNCHING MACHINES

AND HIS

STEAM-PUMPS

FOR

GAS-WORKS,

Feeding Boilers, Steam Fire-Engines, Colliery Deep Lifts, Irrigation, Contractors, and Chemical purposes.

WORKS:

OLDFIELD ROAD, SALFORD, MANCHESTER.

IMPORTANT to GAS COMPANIES.

ENORMOUS SAVING.

JOHN ABBOT & CO., LIMITED,

OF SUFFOLK LANE, LONDON, AND GATESHEAD,

Manufacture and Erect

HYDRAULIC CRANES

For Discharging Coal Barges;

WAGGON HOISTS

For Lifting Coals to Retort-House Stageway;

CAPSTANS

For Moving Trucks about the Yard,

And Apparatus for Lifting PURIFIER COVERS.

Examples to be seen at Beckton, Hull, &c., &c.

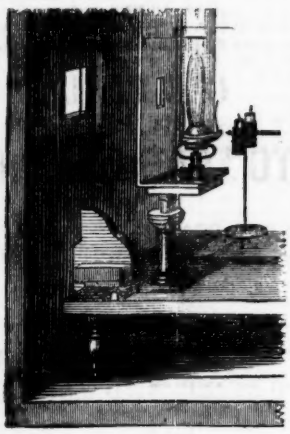
NEW PATENT WET GAS-METER,
THE "RELIANCE,"
MANUFACTURED BY THE
GAS-METER COMPANY, LIMITED,
238, KINGSLAND ROAD, LONDON; UNION STREET, OLDHAM; HANOVER STREET, DUBLIN.
SOLE AGENT FOR SCOTLAND: JAMES KEITH, EDINBURGH AND ARBROATH.

The object attained by this invention is the *correct measurement of Gas under every fluctuation of the pressure.*

Accuracy is obtained by subjecting the whole of the water which determines the measuring chambers of the drum to one uniform even pressure, and so prevents unequal displacements of the water-line.

The "RELIANCE" METER has been tested by several of the most experienced official meter inspectors. Copies of their reports may be obtained on application to the

GAS-METER COMPANY, LIMITED,
238, KINGSLAND ROAD, LONDON.



ERRORS IN THE PHOTOMETRIC ESTIMATION OF THE VALUE OF GAS
are AVOIDED by the use of
METHVEN'S
ILLUMINATING POWER STANDARD.

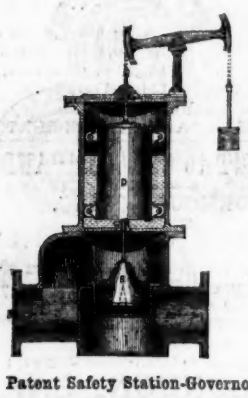
The Illustration shows the application of the METHVEN STANDARD to a LETHEBY PHOTOMETER, with provision for the use of candles in the most approved manner. The Standard consists of a Brass Screen, fitted with a silver-face plate, pierced with a Vertical Slot of the requisite dimensions to allow of the passage of a quantity of light equal to the power of two average sperm candles, from the Standard Argand Burner fixed behind the screen.

THE "STANDARD" CAN BE APPLIED TO ANY BUNSEN PHOTOMETER.

Prices and particulars to be obtained from the
Sole Authorized Makers,
ALEXR. WRIGHT & CO.,
55, 55a, and 56, MILLBANK STREET, LONDON, S.W.

R. LAIDLAW AND SON,
EDINBURGH AND GLASGOW.
Manufacturers of
CONSUMERS IMPROVED WET GAS-METERS,
THE UNVARYING WATER-LINE GAS-METERS,
IMPROVED DRY GAS-METERS, in Cast-Iron or Tin-Plate Cases;
STATION-METERS, ALL SIZES, with PLANED JOINTS;
Experimental Meters, Photometers, Pressure-Gauges, Governors, Test Holders, &c., &c.
LONDON OFFICE:
6, LITTLE BUSH LANE, CANNON STREET, E.C.

PEEBLES'S
PATENT GAS GOVERNORS,
FOR
Stations, Districts, Public Lamps, & Dwelling-Houses,
Are meeting with increasing favour, and giving full satisfaction where they are in use.



Patent Safety Station-Governor.

Wet and Dry Gas-Meters of Superior Excellence, Station-Meters, &c.

Prices and Illustrations Post Free on Application.

D. BRUCE PEEBLES & CO.,
TAY WORKS, BONNINGTON, EDINBURGH.

London: Printed by WALTER KING (at the office of Clayton & Co., 17, Bouverie Street, Fleet Street), and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, August 31, 1880.